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PROGRAMMES
OF
INDUSTRIAL DEVELOPMENT

1961-66

GOVERNMENT OF INDIA • PLANNING COMMISSION

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INTRODUCTION

Following the reports on the two five-year plans of India, the Planning Commission brought out in December, 1952 and in July, 1956 separate volumes on the Programmes of Industrial Development. In the volume published in 1956, the progress recorded by selected industries in the preceding quinquennium as compared to forecasts made earlier and the targets and programmes under the Second Five Year Plan, which had been outlined in a nutshell in the Chapter on Industries of the main report, were elaborated in considerable detail. In the present volume some new industries have been dealt with for the first time, and the same function has been fulfilled as in the past by bringing together statistical data relating to 75 organised industries together with programmes for their expansion during the period of the Third Five Year Plan. With the exception of the hurricane lanterns industry, all the industries covered by the previous volume have again been included and the following have been added:

New Industries treated for the first time in this Volume

1. Ferro-alloys—ferro-silicon & ferro-chrome.
2. Alloy, tool and stainless steels.
3. Non-ferrous metals—copper, zinc and lead.
4. Tungsten carbide.
5. Pipes and tubes—ferrous.
6. Steel wire (including welding electrodes).
7. Steel wire ropes.
8. Castings and forgings—ferrous.
9. Machine tools.
10. Motor cycles and scooters.
11. Construction equipment—crawler tractors, road rollers etc.
12. Industrial and scientific instruments.
13. Steam boilers.
14. Compressors.
15. Typewriters,
16. Heavy electrical equipment.
17. Switchgear and controlgear.
18. Refrigerators and other coolers.
19. Electric house service meters.
20. Photographic films and paper.
21. Clocks and watches.
22. Industrial gases.

23. Medical appliances—surgical instruments and X-ray equipment.
24. Electric porcelain insulators, H.T. & L.T.
25. Organic Chemicals.
26. Milk products.

Ferro-silicon and ferro-chrome are considered together with ferro-manganese under the head 'Ferro-alloys' and similarly, fibre board and particle-board under 'Plywood industry'. Some re-arrangement of machinery items and end-products of steel has been made in this volume by giving the status of separate industries to machine tools, motor cycles and scooters, castings and forgings, steel wire, pipes and tubes and heavy electrical equipment instead of treating them under allied industries, or as a part of many items grouped together under a broad head. The 75 industries covered in this Volume are estimated to account for not less than 90 per cent of the fixed investment under organised manufacturing industries at the present time.

An attempt has been made to outline the developments in the decentralised sector under some of the light engineering industries more elaborately than in the past.

The material relating to the various industries has been presented, as far as practicable, in a uniform manner. Facts and figures are set out in the first section on each industry regarding the progress made in the past five years with reference to the targets proposed in the Second Plan and thereafter the expansions or other developments envisaged during the next five years are described. In the case of industries not included in the previous volume, a brief history of their development upto the beginning of 1960 has been provided.

Progress in the Second Plan

As compared to the modest levels of new investments and the emphasis on fuller utilisation of the installed capacity already in existence visualised for the industrial sector during 1951-56, the Second Five-year plan assigned a crucial role for industrial expansion with special emphasis on iron and steel, heavy engineering and heavy chemical industries. The levels of investment and the build up of new capacity proposed under the major producer and capital goods industries were a reflection of the importance attached to the rapid promotion of the growth potential of the national economy and to the part that industrialisation has to play in the context of the long-term goals set for achievement by 1975-76. Keeping in view the socio-economic objectives to be secured and the role that the State has to play for this purpose in the fields of industry, minerals and power, the industrial policy resolution was suitably revised and announced by the Government in April, 1956. (*Vide* Annexure at the end of the Volume).

Though in the initial years, the industrial programmes encountered heavy weather as a result of the foreign exchange crisis of 1957 which led to a reappraisal of the Plan as published in May 1958, the assistance from the friendly countries available in the later period helped in the fulfilment of the physical targets to the extent of about 85 to 90 per cent. The most impressive achievement under the Second Plan is the setting up of the three

steel plants of one million tons ingot capacity each in the public sector at Bhilai, Rourkela and Durgapur and the completion of the modernisation and expansion programmes of M/s. Tata Iron & Steel Co. (TISCO) and M/s. Indian Iron & Steel Co. (IISCO) in the private sector which added a further 1·5 million tons of steel ingot capacity. The value of output equivalent to the new steel capacity built in this period would be of the order of Rs. 200 crores per annum. With rising levels of steel output from this new capacity, the growth of the economy can be sustained more easily in the coming years than would have been possible otherwise. This is an important gain under the Second Plan. The investment on the steel programmes alone, which amounted to about Rs. 750 crores during 1956-61, was about 2·5 times the combined new investment made by the public and private sectors (about Rs. 290 crores) on new industrial capacity under the First Plan.

The shortage of foreign exchange and the consequently longer time involved in making arrangements for the import of capital goods for some of the other major industrial projects in the public and private sector led to delays in the implementation of projects in some fields and shortfalls *vis-a-vis* targets set for them under Second Plan. The shortfall in capacity occurred chiefly in fertilizers, heavy electrical equipment, heavy machineries, cement, newsprint, chemical pulp, aluminium and certain items of industrial machinery like paper and cement plant machinery.

The current assessment of the overall investment in organised industries as compared with the estimates furnished in the Introduction to the Volume on the Programmes of Industrial Development, 1956-61 (page ix) is roughly as follows :

Break-up of the overall investment in the industrial sector under the Second Plan

(Rupees crores)

	Forecast under the Second Plan	Current assessment
1. Metallurgical industries (iron & steel, aluminium and ferro-manganese).	502·5	770·0
2. Engineering industries (heavy and light)	150·0	175·0
3. Chemical industries (heavy chemicals, fertilizers, drugs and pharmaceuticals, coal carbonisation, dyestuffs, plastics and chemical pulp).	132·0	140·0
4. Cement, electric porcelain and refractories	93·0	60·0
5. Petroleum refining	10·0	30·0
6. Paper, newsprint, security paper	54·0	40·0
7. Sugar	51·0	56·0
8. Cotton, jute, woollen and silk yarn and cloth	36·3	50·0
9. Rayon and staple fibre	24·0	34·0
10. Others	41·5	115·0
11. Replacement & modernisation	150·0	150·0
TOTAL	1,244·3	1,620·0

As regards progress on the production front, the achievements have been quite satisfactory though there were no doubt serious shortfalls under a few major items. The production of machinery for the cement and paper plants has been started for the first time in this period ; so also some other engineering products like compressors etc. In the field of chemicals, there has been advance on a wide front leading not only to larger units and greatly increased output of basic chemicals *e.g.* nitrogenous fertilizers. caustic soda, soda ash and sulphuric acid, but also to the manufacture of a number of new products *e.g.* urea, ammonium phosphate, sodium hydrosulphite, industrial explosives, polyethylene and vat dyes. With the exception of the items shown in the table below, the targets for the rest have been approximately fulfilled and in some cases *e.g.*, power driven pumps, diesel engines, electric motors, A.C.S.R. cables, electric fans, radio receivers and sugar exceeded. The index of industrial production (1950-51 = 100) has risen to 194 in 1960-61 as compared to 134 at the end of the First Plan.

Shortfalls in actual performance *vis-a-vis* the production target for 1960-61 under the Second Plan

	Unit	Production target	Actual production
1. Steel finished	million tons	4·3	2·4
2. Nitrogenous fertilizers (in terms of nitrogen).	'000 tons	290	97·1
3. Phosphatic fertilizers (in terms of P_2O_5).	'000 tons	120	53·03
4. Textile machinery	Rs. crores	17	10·4
5. Cement machinery	Rs. crores	2·0	0·6
6. Paper machinery	Rs. crores	4·0	0·01
7. Aluminium	'000 tons	25·0	18·2
8. Newsprint	'000 tons	60·0	22·9
9. Chemical pulp	'000 tons	30·0	..
10. Soda ash	'000 tons	230	145
11. Caustic soda	'000 tons	135	96·7
12. Dyestuffs	million lbs.	22·0	11·99
13. Cement	million tons	13·0*	7·8

*Revised to 10—11 million tons in May, 1958.

In the Second Plan some success has also been achieved in the dispersal of industry. New centres of industry have been brought into existence in areas of the country hitherto untouched by it *e.g.*, Bhilai, Rourkela, Durgapur, Neiveli, Bhopal, Gauhati and Barauni as a result of the action taken by the State. The claims of under-developed regions of the country have generally been kept in view to the extent possible in the licensing of private sector projects.

As regards export targets fixed for the Second Plan, it was stated in para 23 of the Introduction to the Volume on the Programmes of Industrial Development: 1956-61 that "in the case of certain industries where this

country has already well-established export markets *e.g.*, cotton and jute textiles, some firm basis exists for formulating export targets over the next five years. But in other cases export targets can be little more than guesses or expressions 'of hope". By and large, the doubts implicit in the observation made in 1956 have been borne out in actual performance of exports as the following data would show. This experience of the Second Plan emphasises the importance of studies of economies of scale and cost structure of indigenous industries, formulation of suitable systems of export incentives and thorough knowledge of external markets for the formulation of export targets on a realistic basis.

Export targets and actual performance in 1960-61

	Unit	Plan targets	Actuals
Cotton textiles : cloth	million Yds.	1,000	659
Jute manufactures	'000 tons	900	785
Art silk fabrics	million Yds.	10	30*
Salable steel	'000 tons	200 to 300	74
Ferro-manganese	'000 tons	100	47
Bicycles	Nos.	150,000	3,740
Engineering goods : other than bicycles	Rs. crores	3 to 5	3.6
Titanium dioxide	tons	1,000 to 1,200	..
Coke	'000 tons	30	41·5
Salt	'000 tons	300	392.5
Vegetable oils	'000 tons	214	60
Starch	'000 tons	10	3·3
Vanaspati	'000 tons	20 to 25	6·5

*Estimated.

In conclusion, it may be stated that the industrial development programmes under the Second Plan were conceived in terms of securing a major break-through in a field crucial for accelerated progress of the national economy on a self-sustained basis. Several of the projects, particularly in the public sector, were in virgin fields and involving complex technological know-how and skills for their successful operation. Serious strains on external account and difficulties in co-ordinating the pace and schedule of development in all the inter-related sectors *e.g.*, mining, power, transport and industry were encountered in carrying the programmes through. Even so, the progress achieved in the last decade and particularly under the Second Plan can aptly be described as the beginning of a veritable industrial revolution which is sharply characterised by a broadening of the industrial base, infusion of latest skills and technology and buoyancy of manufacturing enterprise, the like of which had no parallel in the history of India.

Industrial Programmes in the Third Plan

The Third Plan has continued the emphasis on rapid industrialisation with accent on investments under capital goods and producer goods industries which characterised the overall approach and the broad strategy for

industrial expansion under the preceding quinquennium. Due recognition to the requirements of growth in the case of essential consumer goods industries has also been given under relevant programmes. The Industrial Policy resolution of April 1956 will continue to provide the broad framework for the respective role of the public and private sectors. As regards the industrial priorities, the relevant portion from Chapter XXVI of the main report on the Third Plan is reproduced below.

"*Industrial priorities.*—Plans for industrial expansion have to hold a balance between different and competing claims of nearly equal importance. There are, however, certain general considerations which require to be mentioned. In the first place, where there are wide gaps between capacity and production or where, by multi-shift operation or the addition of balancing equipment, it is possible to secure greater output at diminishing cost, fuller utilisation of existing installed capacity must take precedence over expansions or the setting up of new units. Secondly, expansion of existing plants will have to be given preference over establishment of new units since the creation of new capacity in this manner will not only be quicker but will also assist in bringing down the investment costs per unit output. For example, the expansion of the Bhilai, Rourkela and Durgapur Steel Plants will lower the investment from about Rs. 2,000 to Rs. 1,500 per ton of finished steel and have a beneficial effect on the level of retention prices.

As regards new developments, the accent will have to be on projects which, by contributing to exports, will earn or, by replacing imports, will save foreign exchange. It will not be possible to allow significant expansion of industries which are heavily dependent on the import of raw materials and whose expansion, therefore, until these materials are available within the country, swells the demand for foreign exchange on maintenance account. On the other hand, having regard both to the short-term and the long-term needs of the economy, special attention will have to be given to the development of industries for whose products there are reasonable prospects of finding export markets.

Subject to these general considerations the emphasis to be given to programmes and projects over the next few years will have to be broadly in accordance with the following priorities.

(i) Completion of projects envisaged under the Second Five Year Plan which are under implementation or were deferred during 1957-58 owing to foreign exchange difficulties.

(ii) Expansion and diversification of capacity of the heavy engineering and machine building industries, castings and forgings, alloy tool and special steels, iron and steel and ferro-alloys, and step-up of output of fertilisers and petroleum products.

(iii) Increased production of major basic raw materials and producer goods like aluminium, mineral oils, dissolving pulp, basic organic and inorganic chemicals and intermediates inclusive of products of petrochemical origin.

(iv) Increased production from domestic industries of commodities required to meet essential needs like essential drugs, paper, cloth, sugar, vegetable oils and housing materials."

The industrial development programmes included in the Third Plan are estimated to entail a fixed investment outlay of Rs. 2,455 crores overall and Rs. 1,110 crores in terms of the foreign exchange element. The industry-wise break-up of these investment outlays and the levels of industrial expansion to which they are related will be found in Annexure II at the end.

The industrial projects in the public sector included under the programmes of Central and State Governments are given in Annexure I at the end. The latest position in regard to locational decisions on public sector projects has been indicated in this Annexure. For their full implementation, the overall fixed investment and foreign exchange requirements of these programmes are placed at Rs. 1,325 crores and Rs. 659·5 crores respectively. It may be pointed out that in the case of certain projects, the estimates of costs on the basis of which the overall figures have been calculated, are lacking in the required degree of precision, since they are in very preliminary stages of formulation in respect of scope, processes, location and other relevant particulars. Also, the estimates of foreign exchange requirements have been made on the assumption that payments will be made in cash and that, broadly, machinery and equipment will be obtained from the cheapest sources of supply. These estimates will be vitiated if changes have to be made in these underlying assumptions.

As compared to these estimates of requirements, the resources available both for the public and private sector programmes are expected, on the reckonings made at the start of the Third Plan, to be deficient. The pattern of financing of the gross fixed assets formation in the private sector (which includes an estimated investment of Rs. 150 crores on replacements and modernisation programmes) is envisaged as follows for industries and minerals for 1961-66. Corresponding data for the Second Plan are also given below to facilitate comparison. The data for the Second Plan do not cover minerals.

Sources and supply of funds for industrial and mineral programmes of the private sector

(Rupees crores)

Sources	Second plan		Estimate for the Third Plan
	Original expectation	Latest estimate	
Institutional agencies	40	80	130
Direct loans and participation by Central and State Governments.	20	20	20
New issues	80	150	200
Foreign credits and participation in capital .	100	200	300
Internal and other resources (net of repayment liabilities).	380	400	600
TOTAL .	620	850	1,250

The indications in regard to the estimated requirement of investment outlays and availability of resources both for the public and private sectors as well as the gap in foreign exchange between the supply and demand as have been reckoned upon, point to the probability that in both sectors there will be a spillover into the Fourth Plan and that some of the physical targets, as shown for 1965-66 may not be fully achieved by the end of the Third Plan period. It would, however, be the endeavour of all concerned to reduce the spillover and the deficiencies to the very minimum.

Two major departures in the Third Plan for the assumptions made under the previous plan deserve to be mentioned. These relate to the revision of industrial targets and the planning of industrial capacity *vis-a-vis* the potential for its utilisation. The approach under the Second Plan to the industrial targets was that "they must not be treated as fixed and immutable, still less as setting ceilings for developments under different industries". Accordingly, several of the original industrial targets were raised in the course of the implementation of the Plan. The anticipation with reference to the Third Plan is that any revision of the industrial targets would have to be considered from the point of view of a totality of circumstances including foreign exchange, domestic resources, transport, power supply and trained personnel as well as the priorities laid down in the Plan. As regards industrial capacity, in the Second Plan period, the needs of regional development were kept prominently in view and the capacity under engineering industries was planned in relation to its utilisation on single shift basis. In view of the importance of maximum export earnings for the success of the Third Plan and the reduction in costs of production that would have to be secured for making Indian products competitive in foreign markets as well as the tight foreign exchange position, production targets have in the context of the next five years been related to more intensive utilisation of plant facilities. Against this background, the capacity of engineering industries is proposed to be built up generally on the basis of its operation on two shifts.

Targets have been now proposed for some industrial products over and above those already listed in the Report on the Third Plan. The Volume also provides detailed information on the investment and foreign exchange requirements of 18 industries which were included under "Miscellaneous Industries" in the Third Plan Report.

The paper on cotton textile industry included in the Volume outlines the results of studies carried out after the publication of the Report on the Third Plan and the decisions of the Government thereon in respect of the relative shares of programmes of modernisation of existing units and the installation of new spindleage. State-wise allocation of the new spindleage recommended for licensing in the first phase of the growth of this industry under the Third Plan has also been indicated.

On the full achievement of the capacity target set out under the Third Plan, the percentage increase in capacity under some of the major products as compared to the expectation and actual results under the Second Plan would present the following picture.

Progress in expansion of installed capacity of selected industries

	Second Plan percentage increase in 1960-61 over 1955-56		Percentage increased over 1960-61 on achievement of the targets envisaged for 1965-66
	As targetted	Actual	
Steel ingots	281	275	70
Finished steel	283	275	67
Aluminium	300	143	381
Copper	..	20	122
Ferro-manganese	514	464	66
Petroleum refining	19	71	74
Nitrogenous fertilizers	349	185	313
Phosphatic fertilizers	243	63	777
Sulphuric acid	107	107	233
Soda ash	181	198	98
Caustic soda	241	182	223
Plastic moulding powders	986	1,217	447
Dyestuffs	110	135	47
Power alcohol	33	48	80
Cement	224	85	65
Refractories	125	84	144
Rubber Manufactures			
Automobile tyres	54	69	130
Bicycle tyres	97	152	155
Automobiles (indigenous content)	220	160	31
Passenger cars Commercial vehicles Jeeps and Station wagons	90	78	87
Sugar	45	29	56
Cotton textiles			
Spindleage	13	13	30
Paper and Paper Board	114	95·2	100
Soft Coke	--	20	111

In reckoning the benefits from the industrial investments under the Third Plan, account will also have to be taken of new industries being built for the first time *e.g.*, heavy machinery and mining machinery, heavy electrical equipment, alloy, tool and stainless steels, compressors and pumps, construction equipment (crawler tractors, scrapers, dumpers etc.) and organic chemical intermediates. Though the contribution from these new industries may not be large in the Third Plan period itself, these are expected to make the task of expansions and development of the industrial, mining and power sectors comparatively easy in the later years by large scale supplies of capital and producer goods from indigenous sources.

It will be found, as in the past, that certain data in this volume are at variance with the statistics given in Chapter XXVI of the Report on the Third Five-year Plan. In the case of a few industries revisions were found necessary, particularly of the capacity and production levels in 1960-61 on the basis of more recent data. In the case of the jute industry, particularly, the detailed programme embodied in this volume envisages a production target of 1·3 million tons of jute manufactures in 1965-66 as against 1·1 million tons proposed in the Report. The change in the data in respect of dyestuff industry for 1960-61 and 1965-66 and the reasons therefor have been explained in the relevant portions of the Volume.

In the collection of the data presented in this Volume and in the formulation of targets, the Commission has received most valuable assistance from the various Ministries of the Central Government, particularly from the Sugar and Vanaspati Directorate of the Ministry of Food & Agriculture and from the office of the Textile Commissioner and above all from the Development Wing of the Ministry of Commerce & Industry. The Commission has also been much assisted by the work of the Development Councils currently functioning and the study on Steel Demand Appraisal of the National Council of Applied Economic Research. Finally, the Commission is greatly indebted to a number of industrial undertakings and industrial associations (too numerous to mention individually) whose representatives attended the conferences during 1959 and 1960, supplied much valuable information and made many useful suggestions. The help rendered by all these various agencies is acknowledged with grateful thanks.

ANNEXURE I

Third Five Year Plan

A INDUSTRIAL PROJECTS IN THE PUBLIC SECTOR (CENTRAL GOVERNMENT)

Name of the Scheme	Location	Total investment (Rs. crores)	Foreign exchange component (Rs. crores)	Capacity in 1965-66 (final capacity in the case of expansions).
1	2	3	4	5
A. Projects under execution and carried over from the Second Plan (a)				
1. Completion of the three Steel plants.	Rourkela Bhilai Durgapur	50·0	20·0	3 million tons of steel ingots and 700,000 tons of pig iron for sale.
2. Rourkela fertiliser factory.	Rourkela			120,000 tons of nitrogen.
3. Heavy machinery plant	Ranchi			45,000 tons of finished machinery.
4. Foundry forge plante	Ranchi	80·0	55·0	94,000 tons of castings and forgings.
5. Mining machinery plant	Durgapur			30,000 tons of mining machinery.
9. Heavy electrical plant	Bhopal	16·0	7·0	Rs. 12·5 crores worth of electrical equipment.
7. Drug projects				
(a) synthetic drugs plant	Sanatnagar (Andhra Pradesh)			Rs. 6·4 crores worth of drugs.
(b) antibiotics plant	Rishikesh (Uttar Pradesh)			Rs. 25·8 crores worth of antibiotics.
(c) phyto-chemicals plant	Munnar (Kerala)	30·0	15·0	Rs. 77 lakhs worth of phyto-chemicals.
(d) surgical instruments plant	Guindy (Madras)			Rs. 2·8 crores worth of instruments.
8. Organic intermediates plant.	Near Panvel (Maharashtra)	11·0	6·0	25,000 tons of organic intermediates.
9. Expansion of Hindustan Antibiotics.	Pimpri (Maharashtra)	0·5	Negligible.	45,000kgs. of streptomycin and 1·5 tons of tetracyclines.
10. Trombay fertiliser factory.	Trombay (Maharashtra)	25·0	13·0	90,000 tons of nitrogen.
11. Naharkatiya fertiliser factory.	Naharkatiya (Assam)	12·0	7·0	32,500 tons of nitrogen.
12. Neiveli fertiliser factory	Neiveli (Madras)	15·68	11·56	70,000 tons of nitrogen.
13. Briquetting and carbonisation plant.		13·84	8·61	380,000 tons of carbonized briquettes.
14. Neiveli thermal power plant.		9·67	5·86	250 MW.
15. Nunmati oil refinery	Nunmati (Assam)	8·5	4·9	0·75 million tons of crude oil.
16. Barauni oil refinery	Barauni (Bihar)	23·0	7·5	2·0 million tons of crude oil.
	TOTAL	295·19	161·4	

2—2 Plan. Com./61.

1	2	3	4	5
B. New projects for which external credits are already assured, wholly or partly.				
17. Expansion of heavy machinery plant.	Ranchi	14·0	11·0	80,000 tons of finished machinery.
18. Expansion of foundry forge plant.	Ranchi	10·0	5·5	153,000 tons of castings and forgings.
19. Expansion of mining machinery plant.	Durgapur	15·0	10·0	45,000 tons of mining machinery.
20. Second heavy electrical project.	Ranipur (Uttar Pradesh).			Rs. 25 crores worth of steam turbines, turbo alternators, hydro-turbines and generators and large sized motors in the first phase.
21. High pressure boiler plant.	Tiruchi (Madras).	69·0	45·0	2,500 tons of steam per hour in the first stage (30,000 tons of iron)
22. Third heavy electrical project.	Ramachandrapuram (Andhra pradesh).			Rs. 12 crores worth of steam turbines and alternators in the first phase. In the second phase the plant will produce diesel generating sets also.
23. Heavy machine tool project.	Ranchi	11·0	9·0	Rs. 3·0 to 4·0 crores worth of machine tools.
24. Precision instruments project* . . .	Kotah (Rajasthan).	8·0	6·0	Rs. 15 crores worth of instruments.
25. Ophthalmic glass project.	Durgapur	2·6	2·0	300 tons of ophthalmic glass.
26. Raw film project .	Ootacammund (Madras).	8·0	5·0	6·3 million sq. meters of raw films, photographic paper etc.
27. Watch factory . .	Bangalore	2·5	1·5	360,000 watches.
28. Expansion of Bhilai Steel plant.	Bhilai	138·0	56·0	2·5 million tons of steel ingots and 300,000 tons of pig iron for sale.
29. Expansion of Durgapur steel plant.	Durgapur	56·0	27·0	1·6 million tons of steel ingots and 300,000 of pig iron for sale.
30. Expansion of Rourkela steel plant.	Rourkela	90·0	50·0	1·8 million tons of steel ingots.
31. Expansion of Hindustan Machine Tools.	Bangalore	3·0	2·0	Rs. 7·0 crores worth of machine tools.
32. Basic refractories project	Bhilai	3·0	1·5	Scope yet to be decided.
33. New machine tool works of H.M.T.	Pinjore (Punjab).	5·0	3·0	1,000 machine tools (Rs. 3·5 crores).
34. Gujerat oil refinery .	Koyali	30·0	15·0	2·0 million tons of crude oil.
35. Expansion of Praga Tools	Secunderabad (Andhra Pradesh).	1·0	0·5	Rs. 1·0 crore worth of machine tools.

1	2	3	4	5
36. Heavy structural works	Near Wardha (Maharashtra)	6·0	4·0@	25,000 tons of heavy structurals on single shift basis.
37. Heavy plate and vessel works.	do.			12,500 tons of chemical plant machinery on single shift basis.
38. Gorakhpur fertiliser factory.	Gorakhpur (Uttar Pradesh).	18·0	8·0	80,000 tons of nitrogen.
39. Security Paper mill .	Hoshangabad (Madhya Pradesh).	5·5	4·0	1,500 tons of security paper.
40. Expansion of Hindustan Cables.	Rupnaraianpur (West Bengal)	3·5	1·2	2,000 miles of dry core cables and 500 miles of plastic insulated city cables on double shift basis.
	TOTAL	499·1	267·2	
	C. Other Projects			
41. Bokaro Steel project .	Bokaro (Bihar)	200·0	100·0	One million tons of steel ingots and 350,000 tons of pig iron for sale.
42. Alloy and tool steel plant.	Durgapur	50·0	20·0	48,000 tons of finished products.
43. Expansion of Bhopal heavy electrical plant.	Bhopal	19·0	8·0	Rs. 25·0 crores worth of electrical equpiment.
44. Expansion of Hindustan Shipyard (expansion and subsidy).	Visakhapatnam	10·0	1·5	
45. Dry dock project of the Hindustan Shipyard.	Visakhapatnam	2·0	0·5	50,000—60,000 DWT.
46. Second shipyard . .	Cochin	20·0	5·0	
47. Expansion of FACT .	Alwaye (Kerala)	8·0	5·6	60,000 tons of nitrogen.
48. Expansion of Nepa mills	Nepanagar (Madhya Pradesh).	4·0	3·0	60,000 tons of newsprint.
49. Salt development . .		3·0	0·8	
50. Heavy compressors and pumps project.	Not yet decided.	15·0	10·0	Scope yet to be decided.
51. Ball & roller bearing project.	Not yet decided.	8·0	6·0	2 million bearings.
52. Additional capacity for machine tools.				
53. Second heavy structural works.	Not yet decided.	15·0	10·0	Scope yet to be decided.
54. Second plate and vessel works.				
55. Marine diesel engine factory.	Not yet decided.	3·0	1·5	

1	2	3	4	5
56. Expansion and modernization of the Government alkaloid factory.	Ghazipur (Uttar Pradesh)	0·4	Neg.	
57. Lubricating oil plant†		12·0	6·0	100,000 tons of HVI lubricants.
58. Low temperature carbonization plants.		22·0	15·0	2·2 million tons of coal.
59. Neiveli lignite high temperature carbonization plant and connected facilities for pig iron production.	Neiveli (Madras)	25·0	13·0	1·0 million tons of lignite.
Townships . . .	At project sites	50·0	..	
	TOTAL	466·4	205·9	
	GRAND TOTAL	1,260·69	634·5	

The investments on some of the above mentioned projects and their completion are expected to spill-over into the Fourth Plan (*Vide* p. xii of Introduction).

(a)Figures of total cost and foreign exchange are the amounts expected to spill-over into the Third Plan.

*This project will specialise in electrical and electromagnetic instruments. A second plant to be located in Kerala and recently included in the Third Plan will concentrate on the manufacture of hydraulic, penumatic and mechanical instruments. The scope of this plant is yet to be decided.

@According to the latest estimates these projects will cost Rs. 10·1 crores and will need foreign exchange expenditure of Rs. 6·4 crores.

†A proposal to set up a lubricating plant by Stanvac in association with the Government is under consideration.

B INDUSTRIAL PROJECTS IN THE PUBLIC SECTOR (MAJOR SCHEMES OF STATE GOVERNMENTS)

Name of the Scheme	Location	Total investment (Rs. crores)	Foreign exchange component (Rs. crores)	Annual capacity in 1965-66 (final capacity in the case of expansions).
1	2	3	4	5
(Schemes with a total outlay of Rs. 50 lakhs or more)				
A. Projects spilling over from the Second Plan (a)				
1. Expansion of Andhra paper mills.	Rajahmundry (Andhra Pradesh)	4·00	2·49	18,000 tons of paper.
2. Expansion of Mysore Iron & Steel Works	Bhadravati (Mysore).			
(a) steel expansion programme.		2·00†	3·50	100,000 tons of steel ingots.
(b) expansion of the ferrosilicon plant.		0·95	0·37	20,000 tons of ferro-silicon.

1	2	3	4	5
3. Expansion of Government electric factory.	Bangalore (Mysore)	0·90	0·48	Electric transformers 200,000 KVA : electric motors 60,000 h.p. : switchgear and switchboards worth Rs. 40 lakhs.
4. Durgapur coke ovens				
(a) gas grid . . .	Durgapur (West Bengal)	2·25		7·5 million c.ft. of gas per day.
(b) tar distillation plant		0·50	0·17	100 tons of tar per day coke 650,000 tons,: benzene 0·725 m. gallons: toluene 0·235 m. gallons: napthalene 1,200 tons: road tar.
(c) doubling of coke ovens and by-products plant		4·20		
B. New projects included in the Third Plan (b)				
5. Natural gas distribution	Assam	1·65	0·30	
6. Gas fractionation and transmission scheme.	Assam	1·50	0·50	
7. Expansion of Bihar superphosphate factory.	Sindri (Bihar)	0·50	0·15	46,000 tons of superphosphate.
8. Expansion of high tension insulator factory.	Ranchi (Bihar)	0·50	0·17	4,800 tons of insulators.
9. Fertiliser project†† .	Not decided	20·00	10·00	80,000 tons of nitrogen.
10. Cotton spinning mill .	Samba (Jammu & Kashmir)	0·50	0·25	12,000 spindles.
11. Pilot iron and steel plant	Madras State	0·75		
12. Steel rolling mill . .	Madras State	1·00		20,000 tons of rolled products.
13. Distribution of gas in Bombay.	Bombay	0·50		20 million c.ft. of gas per day.
14. Reorganisation of the workshop at Nangal.	Nangal (Punjab).	0·50		
15. Refractories plant . .	Churk (Uttar Pradesh)	0·85	0·30	24,000 tons of refractories.
16. Expansion of the precision instruments factory.	Lucknow (Uttar Pradesh)	0·69	0·22	
17. Organic chemicals* .	Durgapur	4·00	2·00	Caustic soda 6,000 tons: phenol 6,600 tons: chlorine 5,800 tons; phthalic anhydride 6,600 tons : formaldehyde 5,000 tons: pentacholoro phenol 1,000 tons.

1	2	3	4	5
18. Cotton spinning mill .	West Bengal	0·65	0·08	25,000 spindles.
19. Miscellaneous schemes costing less than Rs. 50 lakhs each.		15·61	4·00	
	GRAND TOTAL .	64·08	24·98	

*Private participation on a minority basis in the equity capital of the project is envisaged.

†Made up of Rs. 5·0 crores in the Central Plan and Rs. 2·0 crores in the State Plan.

††Provisionally indicated in the state sector. Final decision about location and agency are yet to be taken.

(a) Figures of total cost and foreign exchange are the amounts expected to spill-over into the Third Plan.

(b) Figures of total cost and foreign exchange represent estimated outlay for the execution of the schemes. In case of some of the listed projects, part of the expenditure would spill-over into the Fourth Plan having regard to the gap between the provision for industries and minerals and the outlay requirement.

ANNEXURE II

Statement showing production in 1950-51, 1955-56, capacity and production in 1960-61 and targets for 1965-66.

Name of the industry	Unit	1950-51 Production	1955-56 Production	1960-61 Capacity	1960-61 Production	Target for 1965-66 Capacity	Target for 1965-66 Production	Fixed investment during 1961-66 (Rs. crores)	Foreign exchange component of fixed investment (Rs. crores)
1	2	3	4	5	6	7	8	9	10
Metallurgical Industries									
1. Iron & Steel									
(a) Steel ingots	million tons	1·4	1·7	6·0	3·3	10·2	9·2	640·0	305·0
(b) Finished Steel	,,	0·98	1·3	4·5	2·4	7·5	6·8		
(c) Pig iron for sale	,,	0·35	0·38	1·1	1·1	1·5	1·5		
2. Alloy, tool and stainless steel (finished)	'000 tons	—	—	—	—	200	200		
3. Ferro Alloys									
(a) Ferro-manganese	,,	..	..	157·8	89·3	220	200	2·5	2·0
(b) Ferro-silicon	,,	..	..	7·0	7·0	40·0	40·0	2·0	1·2
(c) Ferro-Chrome	,,	—	—	..	..	20·0	20·0	1·0	0·5
4. Aluminium	,,	3·7	7·3	18·1	18·2	87·5	80·0	65·0	32·0

1	2	3	4	5	6	7	8	9	10
5. Non-Ferrous Metals									
(a) Copper	'000 tons	6·6	7·5	8·8	8·8	22.0	20·0	0·6(b)	0·4(b)
(b) Zinc	,,	..	..	..	..	15·0	15·0	7·3*	2·7*
(c) Lead	,,	0·8	2·1	6·0	3·7	8·5	8·0		
6. Tungsten carbide	tons	--	..	--	..	48	25	1·0*	0·5*
Mechanical Engineering Industries									
7. Pipes and Tubes : Ferrous									
(a) Cast iron pipes	'000 tons	..	97(c)	270	209(c)	800	800	5·0	4·0
(b) Steel pipes	,,	--	..	299 to 359	96(c)	450 to 510	450	4·5	3·0
8. Steel Wire (including welding electrodes)									
(a) Steel wire	'000 tons	..	36	123	40	400	400	7·5	4·4
(b) Welding electrodes	million r.ft.	23(c)	122(c)	420	362(c)	1,080	900		
9. Steel wire ropes	'000 tons	--	..	6·1	3·3	40·0	40·0	1.8	0·6
10. Castings & Forgings									
(a) Grey iron castings	million tons	..	..	0·6	..	1·2	1·2		
(b) Steel Castings	'000 tons	..	15(c)	39	34	200	200	30·0(a)	15·0(a)
(c) Steel forgings	,,	..	..	43	35	200	200		
11. (a) Structural fabrication (including wagons, heavy structural shop)	'000 tons	..	200	500	225	1,100	1,000	45·0	22·0
(b) Heavy plate and vessel works	,,	..	--	--	..	40	30		

12. Industrial Machinery (1)										
(a) Programmes in public sector.										
(i) Steel & chemical machinery	'000 tons	—	..	—	—	80	15 to 20	119·0	81·5	
(ii) Coal Mining machinery	,,	..	..	..	..	45	20			
(b) Programmes in private sector.										
(i) Cotton textile machinery	Rs. crores	..	5.4(c)	12·0	10·4(c)	22·0	20·0	5·0	3·0	
(ii) Jute mill machinery	,,	..	..	2·5	1·7	2·5	2·5	..	..	
(iii) Sugar mill machinery	,,	..	0·2	11·6	4·2(c)	15 to 16	14·0	3·0	2·0	
(iv) Cement machinery	,,	..	0·4	1·1	0·6(c)	4·5	4·5			
(v) Paper mill machinery	,,	..	..	3·70	0·01(c)	8·5	6·5 to 7·0	7·0	4·0	
(vi) Dairy machinery	,,	..	—	0·3	0·2(c)	2·5	2·5	0·5	..	
(vii) Cranes	'000 tons	..	..	8·3	1·6(c)	60·0	60·0	3·0(d)	1·0(d)	
13. Machine Tools (organised sector)	Rs. crores	0·34	0·78	8·0	7·24(c)	30·0	30·0	40·0	27·0	
14. Construction Equipment										
(a) Crawler tractors	Nos.	..	..	—	—	600	500	3·0	2·0	
(b) Dumpers and scrapers	,,	..	..	..	..	600	500			
(c) Shovels	,,	..	..	..	..	125	100			
(d) Road rollers	,,	..	—	414 to 464	388(c)	800	700			

1	2	3	4	5	6	7	8	9	10
15. Steam Boilers	Rs. crores	..	..	3·7	0·53(c)	29·0	25·0	7·0(d)	4·0(d)
16. Industrial & scientific instruments	,,	..	..	3.5	3·0	23.0	12·0	9·0	6·5
17. Railway Rolling Stock									
(a) Locomotives									
(i) Steam	Nos.	7	179	300	1,291(g)	300	1,191(g)		
(ii) Diesel	,,	—	..	—	..	..	115(g)		
(iii) Electric	,,	..	..	—	—	60	164(g)	2·0	1·0
(b) Wagons (in terms of 4 wheelers)	,,	2,924	41,966(g)	26,000	69,130(g)	33,500	117,144(g)		
(c) Passenger Coaches	,,	479	4,384(g)	1,800	7,332(g)	1,900	7,879(g)		
18. Ship building	'000 DWT	..	70(g)	'25 to 30	9·5	50 to 60	50 to 60	32·0	7·0
19. Automobile and Ancillary Industries									
(a) Passenger Cars	'000 Nos.	16·5	25·3	20·2	19·1(c)	30	30	85·0	40.0
(b) Commercial Vehicles	,,			28·0	27·5(c)	60	60		
(c) Jeeps and Station Wagons	,,			5·5	5·5(c)	10	10		
20. Motor cycles and Scooters									
(a) Motor Cycles	'000 Nos.	..	1·5	5·0	4·0	48 to 60	50		
(b) Scooters	,,	..		18·0	13·6				
21. Ball & Roller Bearings	million Nos.	0·06	0·9	1·7	3·2	11·0	15·0(h)		

22. Compressors	Rs. crores	—	—	2·3	1·5	7·5	7·5		
23. Agricultural implements and machinery									
(a) Power driven pumps	'000 Nos.	34	37	128	105	184	150	24·25	16·30
(b) Diesel Engines (Stationary)	,,	5·5	10	47·7	43·2	72	66		
(c) Tractors	,,	..	..	Neg.	Neg.	12	10		
24. Typewriters	,,	..	..	45·0	23·5	100	100(p)		
25. Bicycles	million Nos.	0·10	0·51	1·12	1·06	2·2	2·0(i)		
26. Sewing Machines	'000 Nos.	33	111	267·4	297·3	700	700(j)		
27. Refrigerators and other coolers									
(a) Domestic Refrigerators	'000 Nos.	..	0·5(c)	13·6	11·4(c)	50	50		
(b) Commercial Refrigerators	,,	..	..	0·4	Neg.	6	6	1·50	0·50
(c) Room Air Conditioners	,,	..	2·1(c)	20·5	10·7(c)	30	50		
(d) Water Coolers	,,	..	0·7(c)	3·9(c)	2·2(c)	20	20		
28. Coated Abrasives & Grinding Wheels									
(a) Coated Abrasives	'000 reams	..	85·3	200·0	144·5	500	400	2·4	1·25
(b) Grinding Wheels	'000 tons	0·2	0·8	2·89	2·04	6.5	5·4		
29. Clocks and Watches									
(a) Clocks	'000 Nos.	..	..	66	52·3(c)	200	200		
(b) Timepieces	,,	..	..	60	Neg.	1,200	1,200	4·0	2·5
(c) Watches	,,	..	..	—	..	1,200	1,200		
30. Medical Appliances—Surgical Instruments and X-Ray Equipment.									
(a) Surgical Instruments (Organised sector)	Rs. crores	..	..	..	0.14	..	3·0	2·7	2·0
(b) X-Ray Equipment	,,	..	..	..	0·1	..	2·0	1·0	0·5

1	2	3	4	5	6	7	8	9	10
				Electrical Engineering Industries					
31. Heavy electrical equipment . . .	Rs. crores	—	—	—	—	80·0	33·0	104·0	60·0
32. Electr transformers (33 KV and below)	million KVA	0·18	0·63	1·40	1·39	4·0	3·5		
33. Electric motors (200 h.p. & below) .	million h.p.	0.10	0·27	1·13	0·73	3.0(k)	2·5(k)		
34. Switch gear and Control gear (11 KV & below)									
(a) H.T. switchgear . . .	Nos.	..	..	330	Rs. 4 crores	2,650	2,250		
(b) L.T. switchgear	,,	..	..	1,000		21,000	18,000		
(c) Motor control gear . . .	million Nos.	..	..	0·08		4·2	3·6		
(d) Iron clad switches and Switch fuses . .	,,	..	..	0·14		0·265	0·225		
35. Electric Cables & Wires									
(a) A.C.S.R.	'000 tons	1·7	8·7	19·3	23·6	55·0	44·0		
(b) Bare copper conductors . .	,,	4·9	8·5	18·7	10·7	18·7	15·0		
(c) Winding wires	,,	0·25	0·67	6·8	4·6	32·0	24·0		
(d) V.I.R. and plastic coated . .	million Yds.	39·4	86·9	463·2	214·2	800·0	600·0		
(e) Paper Insulated	miles	..	..	884	620	4,500	4,000		
(f) Dry core cables	,,	..	525	471(1)	1,077	2,000 to 2,500	2,000	32.0	19.0
(g) Coaxial trunk cables . . .	,,	..	..	300	57	300	300		

36. Electric fans	million Nos.	0·19	0·29	1·74	1·06	2·8	2·5		
37. Electric house service meters	million Nos	..	0·26(c)	0·38	0·51	2·5	2·1		
38. Electric Lamps									
(a) G.L.S. & Others	million Nos.	15·0	24·2	47·6	41·8	76·0	68·0		
(b) Flourescent tubes	,,	..	0·8	1·2	1·7	7·0	6·0		
(c) Miniature lamps	,,	..	2·1	26·9	21·1	55·0	50·0		
39. Dry batteries	million Nos.	136·5	161·5	224·5	214·2	400.0	350·0		
40. Storage batteries	'000 Nos.	200·0	258·1	379·3	521·2	900·0	800·0		
41. Radio receivers. (organised sector)	'000 Nos.	49	102	279	280	900	800		
Chemical and Allied Industries									
42. Fertilizers									
(a) Nitrogenous (in terms of Nitrogen)	'000 tons	9	79	158·3	97·2	1,000	800	225·0*	100·0*
(b) Phosphatic (in terms of P_2O_5)	,,	9	12	57·3	53·0(c)	500	400		
43. Heavy Chemicals (Inogranic)									
(a) Sulphuric Acid	'000 tons	99	164	526	354	1,750	1,500		
(b) Soda Ash	,,	45	81	268	145	530	450	55·0*	23·0*
(c) Caustic Soda	,,	11	35	124	97	400	340		
(d) Calcium Carbide	,,	..	3(c)	23	9·9(c)	67	60		
44. Coal Carbonisation & coal tar distillation									
(a) Soft coke (Low temperature carbonisation)	million tons	..	..	..	..	2·0	1·8	42·0	26·6
(b) Hard coke—by product	,,	..	..	10·76	4·77	16·7	12·5	29·2	13·0

1	2	3	4	5	6	7	8	9	10
45. Heavy Chemicals (Primary Organic) .									
(a) Phthalic Anhydride . . .	'000 tons.	—	..	..	..	15·0	10·0		
(b) Phenol bye product and synthetic.	,,	..	..	..	..	16·0	14·3		
(c) Methanol	,,	..	—	0.06	0.02(c)	25 to 30	21·5		
(d) Acetic Acid	,,	..	—	3.2	0.0(c)	31·0	28·0	10.0**	4·0**
(e) Carbon disulphide . . .	,,	—	..	..	..	50·0	45·0		
(f) Rubber Chemicals . . .	,,	—	—	—	..	3·0	3·0		
(g) Benzene	,,	..	..	8.4	1.2(c)	68·0	52·0		
(h) Naphthalene	,,	..	..	0.6	0.6(c)	17·5	15·5		
(i) Synthetic Rubber	,,	..	..	..	..	50.0	50.0	25.0	12·5
46. Dyestuffs and Intermediates									
(a) Dyestuffs	million lbs.	..	4.0	17.05	11·99	25·0	21·2	28·0	13·0
(b) Intermediates	tons.	..	..	..	..	25,000	25,000		
47. Pharmaceuticals, Drugs and Pesticides									
(a) Sulpha drugs	tons	..	83(c)	366	145(c)	1,000	1,000		
(b) Penicilline	million mega Units	..	6·6	55·0	39·7(c)	120·0	120·0		
(c) Streptomycin	tons	..	..	..	..	150	150		
(d) P.A.S.	,,	..	40(c)	100	81.3(c)	400	400		
(e) Anti-dysentery drugs . . .	,,	..	6·0(c)	73·7	24·7	75·0	75·0	39·3	18·0
(f) I.N.H.	,,	..	1·0(c)	33·1	26·3	100·0	100·0		
(g) Phyto chemicals. . . .	,,	..	..	..	..	76·4	76·4		
(h) D.D.T.	,,	..	284	2,800	2,786(c)	2,800	2,800		
(j) B.H.C.	,,	..	..	3,900	3,830(c)	15,000	15,000		
48. Plastics (Polyethylene, P. V. C., Polystyene and others)	'000 tons	..	0·7	15·5	9·5	85·0	74·0	27·5*	10·5*

49. Photographic films and paper	million Sq. metres	..	..	..	..	..	10·0	10·0	9·0*	5·5*
50. Paints and varnishes (organised sector)	'000 tons	..	..	88·0	52·5	160·0	140·0	2·0	0·2	
51. Soap and Synthetic detergents										
(a) Soap (2)	,,	106	102	250	140(c)	255	500	..	..	
(b) Synthetic detergents	,,	..	..	7·2	1.63	20.0	20·0	3·0	1·0	
52. Starch and Glucose										
(a) Starch	'000 tons	..	43·4(c)	148.6	68·5	158·2	120·0			
(b) (i) Liquid glucose	,,	..	1·0(c)	12·9	8·7	15·9	14·0	5.0	1.0	
(ii) Dextrose powder	,,	..	..	4·3	2·6	10·91	10·0			
53. Rubber Manufactures										
(a) Automobile tyres	million Nos.	..	0·9	1·61	1·49	3·7	3·0			
(b) Bicycle tyres	,,	..	5·8	15·12	11·15	38·6	30·9	11.5	5.0	
54. Tanning and footwear										
(a) Tanned hides and skins	million pieces	..	..	..	47·6	..	52·0	..	..	
(b) Leather footwear	million pairs	85·0	88·5	..	102·0	..	140	..	..	
55. Paper and paperboard										
(a) Paper and paperboard	'000 tons.	114	187	410	343	820	700	100	35	
(b) Newsprint	,,	..	3·6	30·0	22·9	150·0	120·0			
(c) Security paper	tons	..	..	..	..	1,500	1,500	5·5	4·0	
56. Cement	million tons.	2·7	4·6	9.2	7·8	15·0	13.0	60	12*	
57. Refractories	,,	..	0·29	0·82	0·55	2·0	1·5	22	10	
58. Electric procelain (H.T. & L.T. insulators)	'000 tons.	..	2·3	12·58	6·25(c)	30·0	24·0	3·0	2·2	

1	2	3	4	5	6	7	8	9	10
59. Glass	'000 tons	92	125	383	225	615	440	11	3·5*
60. Petroleum Refining									
(a) Petroleum products	million tons	..	3·6	6·0 (crude oil)	5·66(c)	10·75 (crude oil)	9·86	73·5	33.4
(b) Lubricating oil	'000 tons	..	—	..	..	100	100		
61. Industrial alcohol	million gallons	8·6	15·2	40·1	20·4	72·0	60·0	4·0	0·4
62. Industrial Gases									
(a) Oxygen	million c.ft.	..	283(c)	1,034	717(c)	2,300·	1,650	11·0*	6·5
(b) Acetylene	,,	—	47(c)	163	89(c)	250	200		
(c) Carbon dioxide	million lbs.	..	..	42	17(c)	48	40		
(d) Nitrous Oxide	million gallons	..	..	22	20(c)	24	24		
Textile Industries									
63. Cotton Textile									
(a) Yarn	million lbs.	1,179	1,640	12·7(3)(c)	1,737(c)	16·5(3)	2,250	32·5*	11·0*
(b) Cloth (Mill made)	million Yds.	3,718	5,101	1·99(4)(c)	5,048(c)	2·25(4)	5800		
64. Jute	'000 tonnes.	906	1,168	1,200	1,022	1,200	1,300	—	—
65. Rayon, Synthetic Fibres and Cellulose Film									
(a) Rayon filament	million lbs.	0·4	16·0	52·3	47·0	140·0	140·0	75	45
(b) Staple fibre	,,	..	14·0	48·0	48·0	75·0	75·0		
(c) Chemical pulp	'000 tons	..	..	..	..	100	90		
(d) Cellulose film	,,	..	..	3·6	2·08	5·4	5·4		

66. Woollen Textiles										
(a) Woollen and Worsted yarn	million yds.	18·3	21·7	0·19(3)	27·8(c)	0·20(3)	52·0	..	..
(b) Woollen Cloth	million yds.	..	15	48	15.3(c)	48	35	..	..
(c) Wool tops (including synthetic fibre tops)	million lbs.	..	..	10·0	..	31·5	31·5	2·0	1·0
Timber Industries									
67. Matches	million gross boxes.	27·1	34·1	45·3	37·5	45·3	42·0	..	..
68. Plywood, Fibre board and particle board									
(a) Teachest-Plywood	million sq. ft.	44·9	93·5	140·4	98·2	168·39	130·0		
(b) Commercial plywood	,,	8·9	20.7		62·5		90—110	5·0	2·8
(c) Fibre-board	,,	..	..	30·33	18·0	125·0	80—100		
Food Industries									
69. Salt	million tons	2·7	3·0	3·8	3·4	6·5	5·4	9·0	2·0
70. Sugar (5)	,,	1·12	1·86	2·25	3·0	3·5	3·5	100·0	12·0
71. Vegetable Oils									
(a) Solvent extraction of oil cakes	'000 tons	..	..	556.2(c) (cakes)	27.1(c) (oil)	2,000 (cakes)	160 (oil)		
(b) Cotton seed oil	,,	..	..	179.3(c)(m) (seed)	13·2(c)(m) (oil)	850 (seeds)	100 (oil)	10·0	2·5
72. Vanaspati	,,	153	276	470	350	550	500		

1	2	3	4	5	6	7	8	9	10
73. Milk Products									
(a) Milk powder	'000 tons	..	..	1·2	0·58(c)	37·5	30·0	2·0	0·5
(b) Condensed evaporated milk .	,,	..	..	3·0	Neg.	7·5	6·0		
(c) Milk food for infants . . .	,,	..	..	5·0	Neg.	7·5	6·0		
74. Biscuits and confectionery									
(a) Biscuits	tons	..	11,765(c)	30,528	23,700(c)	30,528	40,000	..	..
(b) Confectionery	,,	..	7,840(c)	51,840	17,000(c)	51,840	25,000	..	..
75. Fruit and vegetable preservation . .	'000 tons	—	14.1(c)	..	40	..	100	1·0	0·4
76. Miscellaneous Industries . . .								116·05(n) 18	·05(n)
						TOTAL .		2454·6	1109·9

N.B.—Capacity for Engineering Industries is estimated on the basis of double shift operation.

*These estimates have been recently revised. The revised figures are indicated in the relevant chapters. In the case of the cotton textile industry, the variation is on account of larger expectations of installation of new spidleage in contrast to the large scale modernisation and replacement programmes originally envisaged.

**Excluding investment on captive plants for carbon disulphide and acetic acid under rayon industry.

(1) Except in the case of cotton textile machinery, capacity and production under this head are related to the demands for original equipment.

(2) Excepting for the production figure in 1965-66, the figures relate to the organised sector only.

(3) Million active spindles.

(4) Lakh looms.

(5) Figures relate to crop year.

(a) Over and above the expenditure envisaged under Foundry/Forge Project, Mining Machinery Project and steel castings foundry of Chittaranjan Locomotive Works.

(b) Investment on the capacity under the public sector is shown under the outlay on Minerals.

(c) Relates to Calendar Year.

(d) Expenditure envisaged on private sector schemes only.

(g) Relates to five year period.

(h) By working the capacity on three shifts.

(i) An additional 0·5 million bicycles are expected to be produced in the small-scale sector.

(j) An additional 150,000 sewing machines are expected to be produced in the small-scale sector.

(k) These figures are for 300 h.p. and below.

(l) Single shift capacity.

(m) Figures relate to organised sector only.

(n) Including Rs. 50 crores for townships and Rs. 47·0 crores for the public sector projects not covered under above industries.

(p) Including 10,000 Nos. expected to be produced in the small-scale sector.

METALLURGICAL INDUSTRIES

1. IRON AND STEEL

The programme outlined under Iron and Steel covers the activities of the main producers and the re-rolling industry. It deals with pig iron (foundary grade and for steel making), mild steel and modified forms of steel such as spring steels, free-cutting steels and high silicon steels for electrical sheets.

A. Main Producers

1. Review of Progress in the Second Plan:

Targets.—For the iron and steel industry, which had been assigned the highest priority and later on designated as the 'core' of the Second Five Year Plan, the following targets were set in 1955 :—

(a) Establishment of new integrated steel works of 1·0 million tons of ingot capacity each in the public sector at Bhilai, Rourkela and Durgapur.

(b) Completion of the modernisation programmes of the Tata Iron & Steel Works (M.E.P. of TISCO) and expansion of the Indian Iron & Steel Works (1953 extensions of IISCO) initiated in the First Plan period, and implementation of further expansion programmes called the two-million tons programme (TMP) of TISCO and the 1955 extensions of IISCO. As a result of these developments, the capacities of TISCO and IISCO were expected to be stepped up to 2·0 million tons and 1·0 million tons respectively of steel ingots.

(c) Expansion of the Mysore Iron & Steel Works (MISW) to a capacity of 0·1 million tons of finished steel in addition to the creation of additional capacity for ferro-silicon production.

(d) The programmes of the main producers would lead to a capacity of 6·1 million tons of ingot steel or 4·7 million tons of saleable steel and also provide supplies of between 660,000 and 870,000 tons of pig iron for sale.

(e) As regards time schedules Bhilai and Rourkela Steel Projects were to go into production as a whole by the end of 1959 and Durgapur Steel Project by December, 1960. TISCO and IISCO were scheduled to complete their construction phase by May 1958 and end of the year respectively.

(f) The total capacity of saleable steel in 1960-61 would be 4·7 million tons of which the contribution of three new public sector projects and MISW is estimated at 2·38 million tons; of TISCO at 1·5 million tons and of IISCO at 0·8 million tons.

(g) Exports of saleable steel in 1960-61 would be between 200,000 and 300,000 tons.

Under the production programme of the Rourkela Steel Works specialising in the manufacture of flat products, a decision was taken in principle, on the eve of the finalisation of the Second Plan, to provide for the manufacture of 50,000 tons of electrolytic tin-plate. Subsequently, the hot dipping process was preferred since capacity of the order proposed was below the level of an economic unit based on the electrolytic process.

A general recommendation was also made by the Planning Commission that the problem of technical personnel for the steel plants was so important that it should receive constant attention in the Plan period.

The progress of the steel industry *vis-a-vis* the targets outlined above for the main producers is briefly outlined below.

Public Sector Steel Projects.—At the commencement of the Second Plan, the Hindustan Steel Ltd. (H.S.L.) was in charge of the Rourkela steel project. Bhilai and Durgapur projects were being progressed departmentally by the Ministry of Iron and Steel. From 1st April 1957, the H.S.L. was made responsible for all the three public sector projects. The construction of these three plants was a stupendous task in view of the diversity of problems that had to be faced under each project. The work on the Rourkela project particularly involved manifold responsibilities on the part of the management covering negotiated purchases of plant equipment for a large number of suppliers abroad and coordination of the programmes and schedules of work of a large number of agencies engaged in the task of construction. The preliminary studies relating to site conditions and arrangements for ancillary facilities like water supply carried out in the initial stages of site selection were found to have been not as exhaustive as required, with the result that a number of modifications had to be made and more intensive work undertaken as compared to original expectations. Further, some additions to the physical content of the projects were also made *e.g.*, the coal tar distillation plant at Durgapur. All these factors led to some delays in the completion of the construction phase of the different sections of the three steel plants. Even so, the completion of the three new steel plants in the period of the Second Plan would, by itself, have to be regarded as a most impressive achievement. The major features of these plants are indicated in Annexure I at the end along with those of the two main producers in the private sector.

By February, 1959 the Bhilai and Rourkela steel projects entered upon the operational phase of iron production. A similar stage was reached at Durgapur in the last week of December, 1959. At the beginning of the Third Plan, the spillover of construction work was as follows :

Rourkela.—The cold rolling mill and the tinning line were the only items in the erection stage, the rest of the plant having been completely installed. In this connection, it is worth mentioning that the pipe plant was decided to be added to the line of activities at Rourkela in April, 1959 and brought into commission in August, 1960. This plant is designed for an ultimate capacity of 120,000 to 180,000 tons of pipes per annum in the range of 8" to 20" diameter.

Bhilai.—By February, 1961, the entire plant has been commissioned with the exception of the sintering plant and the tonnage oxygen plant.

Durgapur.—The merchant mill, the wheel and axle plant, third coke-oven battery and the third blast furnace were the major items left incomplete at the end of March, 1961.

The progress on the expansion programme of the Mysore Iron & Steel Works suffered a setback and with the exception of ferro-silicon project, the rest of the expansion schemes had to be carried over to the Third Plan period. There are many factors accounting for non-implementation of the expansion schemes during the Second Plan period such as delay in reaching decision on the process to be selected for steel melting, preparation of engineering reports and deferred payment arrangements for purchase of plant and machinery required for the expansion schemes. Orders for supply of the plant and machinery were placed in November, 1960 and therefore implementation of expansion schemes together with expansion of ancillary works, could be undertaken only towards the end of the Second Plan.

Expansion Programmes of the Private Sector.—The execution of the development programmes of *TISCO covered simultaneous action on the M. E. P. & T. M. P. parts without stopping the production of steel from the existing plants and with the minimum of interference thereto. The effort involved in the implementation of the programmes proved to be more complex and strenuous than anticipated in the stage of preparatory planning of these expansion programmes. With the exception of the projects planned for execution by the Company's engineering department such as the new merchant mill and the revamping of the old sheet bar and billet mill, which were later on phased over a longer period, the expansion programme of TISCO was completed by December, 1958 with the installation of the last item, the medium and light structural mill. The departmental schemes were also completed by the end of 1960 so that by the end of Second Plan the construction phase was fully over and the energies of the company were concentrated on the task of stepping up the production in each section of the works and co-ordinating at peak efficiency the various operations to increase the production of the metal and the different saleable products.

As regards the programme of IISCO, all the major extensions to the iron and steel producing sections of the plant were completed by August, 1959. In the finishing mills, the extension to the Morgan billet mill was completed in May, 1960. The Morgan continuous Merchant and Rod Mill was formally opened on 10th June, 1960 when bars were rolled. This mill, which is the first of its kind to be installed in India, can cover a wide range of products such as rods from 5·3 mm. diameter to 50 mm. diameter, and sections from 25 mm. to 75 mm. in angle, channels and joints. Rods between 5·3 mm. diameter and 12 mm. diameter are proposed to be made into coils of 900 mm. diameter and weighing approximately 200 kg. The mill is mostly automatic and has a fine degree of speed control. With the opening of this mill, all major items of plant under the 1955 extensions programme were completed. Due to the complexity of the mill and the wide variety of

*For full details, see the publication "Symposium on Iron and Steel Industry in India," August, 1959, pp. 493-515 published by the Technical Journals of India Ltd., Calcutta-1.

products to be rolled, considerable amount of commissioning work is anticipated and a period of about 18 months is estimated to be required before it would be producing its full range of commercial products at the designed output of 30 to 60 metric tons per hour, depending on the size being rolled.

Both at TISCO and IISCO, though the expansions have been broadly completed, it is envisaged that the provisions of certain items of subsidiary services would be required before the steel plants would achieve their capacity output *e.g.* modifications to ore preparation plant and addition of tonnage oxygen plant at TISCO; and modernisation of the 34-inch mill stands by the provision of new manipulators and roller tables at IISCO.

Production

Saleable Steel.—The actual performance of the main producers in respect of production has fallen behind the targets envisaged. This is due to diversity of factors, the importance of which was not fully foreseen and taken into account in making the forecasts. The major problems which affected production are:

(a) The relatively long time required in overcoming the teething troubles associated with the initial phase of plant operations and achieving the peak level of efficiency in co-ordinating the production activities of the various departments.

(b) The difficulties in respect of raw materials, *viz.*, iron ore, coal and limestone.

(c) The paucity of experienced personnel for operating the steel plants.

(d) The high ash content of coal and the delays in the construction and operation of coal washeries.

The actual production of saleable steel (this includes semis further processed by re-rollers) from TISCO & IISCO as compared to the forecasts made in the Tariff Commissioner's Report of 1956 was as follows in the Second Plan period:

Production of TISCO and IISCO

('000 tons of saleable steel)

	TISCO		IISCO	
	Forecast	Actual Production	Forecast	Actual Production
1956-57	800	812	300	444
1957-58	900	799	375	412
1958-59	1,250	899	520	498
1959-60	1,500	1,237	640	673
1960-61	1,500	1,263	800	722
TOTAL	5,950	5,010	2,635	2,749

The production of saleable steel from the public sector plants has also fallen below the target envisaged in the plan.

Pig Iron for sale.—The production of pig iron for sale showed a significant rise from 1959 onwards as the following data would show :

Production of Pig Iron for sale

(in '000 tons)

	1956	1957	1958	1959	1960
TISCO	102·9	96·5	26·1	22·2	8·8
IISCO	216·2	229·8	346·8	275·5	206·2
MISW	32·9	56·7	68·1	26·1	47·8
ROURKELA	..	..	..	136·1	184·5
BHILAI	..	..	..	292·4	389·6
DURGAPUR	..	..	..	..	238·0
KALINGA INDUSTRIES .	..	..	..	..	18·6
TOTAL .	352·0	383·0	441·0	752·3	1,093·5

The Kalinga Industries has installed a pig iron plant of 15,000 tons annual capacity at Barbil (Orissa) on the basis of the low-shaft furnace technique making use of nut coke. An experimental plant for studying the suitability of low grade fuels and iron ores in pig iron production by this process was installed in Jamshedpur at the National Metallurgical Laboratory. The equipment for this plant valued at about Rs. 27·0 lakhs was supplied as part of the aid from TCM to India.

Imports of pig iron and steel.—It was reckoned under the Second Plan that the internal availability of pig iron for sale would fall short of the 1955-56 level of 328,500 tons in the following three years and imports would be necessary to meet the indigenous requirements. In the last two years of the Plan (1959-61), the situation would change sharply in regard to indigenous availability and no imports would be needed. As regards steel, the assumptions were that the overall import requirements for the five-year period were likely to be 6·0 million to 6·5 million tons on the basis of the forecasts of growth of demand and indigenous production (*vide* page 16 of the Volume on Programmes of Industrial Development, 1956-61) and that practically there would be no imports in 1960-61.

The actual imports of pig iron and steel in the Second Plan period were as shown below :

Imports of Iron & Steel

	('000 tons)
1956	1,718
1957	1,661
1958	1,173
1959	942
1960	1,131

Though in terms of overall tonnage, the imports of iron and steel have not exceeded the estimates made for the Second Plan, the value of imports was considerably in excess of the level of Rs. 430 crores (p. 99 of the Second Plan) reckoned as the draft on foreign exchange, on account of the rise in c. i. f. price of these products. The value of imports for the five years 1956 to 1960 totalled about Rs. 519·0 crores. Further, contrary to the expectations under the Plan, large-scale imports had to be provided in 1960-61 also.

Exports.—On account of the time lag which occurred in achieving the targetted production of iron and steel, the actual exports, in 1960-61 were well below the target set for the year. Actual exports of pig iron and steel were as follows:

Exports of Iron & Steel in 1960-61

	Quantity (tons)	Value (Rs. crores)
(*a*) Pig iron	100,504	2·4
(*b*) Steel:		
Blooms, billets & slabs	57,750	2·15
Steel ingots	10,812	0·36
Others (excluding ferro alloys, steel tubes and pipes)	2,484	0·25
TOTAL STEEL	71,046	2·76

Distribution of steel.—In relation to the demands made for steel by the various sponsoring/co-ordinating authorities, the total availability in the country, made up of indigenous production and imports, was limited and distribution of steel continued to be regulated through allocations throughout the Second Plan period. In making these allotments, the demands of the various projects included in the core of the Second Plan in the Appraisal and Prospects of the Second Five Year Plan (May, 1958) and of subsequent additions to the core projects and other important and essential demands have been met in full. With larger indigenous production and easing of supply position in most categories, the quota system of allotment of steel was liberalised during 1960-61. From the first half of 1960-61, demands for all categories other than sheets, wire, tinplates and baling hoops were accepted in full, without any quota certificate or authorisation.

The demand for steel, based on the demands sent for allocations by the sponsoring/co-ordinating authorities and the quota-wise allotments made from 1956-57 onwards are indicated below :

Aggregate demand of indenting authorities

	(In million tons)
1956-57	3·487
1957-58	4·145
1958-59	4·266
1959-60	4·791
1960-61	5·072

Quota-wise allocation of steel in 1956-61

(in '000 tons)

	1956-57	1957-58	1958-59	1959-60	1960-61
Railway & Defence . .	490	520	396	318	936
Industrial Maintenance and Packing.	109	108	109	118	94
Steel Processing and Small Scale Industries.	428	384	541	836	982
Government Development Schemes.	409	564	632	739	557
Private Industrial Development	165	145	163	134	145
Agricultural purposes . .	101	80	100	319	391
States (non-agricultural Govt. Development Schemes, and Steel Processing Industries).	295	270	390	778	1,142
Rehabilitation, Export Reserves and Export Promotion.	27	20	27	69	54
TOTAL .	2,024	2,091	2,358	3,311	4,301

The estimated requirement in the last year of the Second Plan, as made by the National Council of Applied Economic Research in its Report on the Steel Demand Appraisal (November 1960) was 3·613 million tons. This estimate is intermediate between the sum total of steel available in 1960-61, on the basis of indigenous production plus imports and the total demand based on the demands received by the Iron & Steel Controller for allotment. It is, however, considered a realistic assessment of the demand situation in as much as it takes note of shortages *vis-a-vis* available supplies in the case of certain categories of steel and the tendency on the part of the indentors to exaggerate their demands in the context of scarcities and the resulting controlled distribution.

Price Policy—The prices of steel are controlled at two levels through the retention prices paid to the producers and the selling prices to consumers. For the period April, 1955—March, 1960 Government fixed a uniform retention price of Rs. 393 per ton for TISCO and IISCO subject to escalation in the event of increases in respect of certain specific items entering into the cost of production *e.g.*, coal price, freight rates on raw materials. The retention price of 1955 was linked with the agreements with producers that the extra profits made by them as a result of the increase will be earmarked specifically for development and expansion and not for any other purpose except with the expressed permission of the Government.

The retention prices had to be revised in the Second Plan period to allow for the incidence of the higher excise duty on steel ingots and the operation of the clauses relating to escalation. At the end of March, 1960 and the beginning of the Third Plan, the retention prices as averaged out for the five-year period 1955-56, were as under:

(*a*) Saleable steel	*Retention price in March*, 1960
TISCO and IISCO	Rs. 428·85 per ton plus Rs. 45·74 per ton on account of excise duty.
MISW ..	Rs. 434·89 per ton plus Rs. 42·85 per ton on account of excise duty.

Retention prices of tinplates and pig iron at the end of the Second Plan were as below:

(*b*) Tin plate

Tinplate Co. of India Rs. 1,070 per ton.

(*c*) Pig iron for sale

TISCO. . . .	Rs. 140·92 per ton plus Rs. 10·16 per ton.
IISCO	Rs. 158·73 per ton plus Rs. 10·16 per ton.
MISW. . . .	*Rs. 206·20 per ton plus Rs. 10·16 per ton.

The IISCO price for pig iron was allowed for Bhilai and Rourkela. A review of retention prices to be allowed to the main producers of steel was called for after the expiry of the quinquennium ending March, 1960. While remitting the examination of the question to the Tariff Commission, a provisional increase of retention prices of the different categories of steel was allowed by the Government on the basis of an *ad hoc* examination of the price structure by the cost accounts department of the Finance Ministry. The controlled selling prices of tested variety of steel and the retention prices at the beginning of the Second Plan and as on 1-5-'61 are given in Annexure II at the end.

The selling price of steel which is higher than the retention price was intended to provide resources for (a) absorbing the freight element on account of the fact that steel is sold at a uniform price at all rail heads in India, (b) equalising the price of imported steel and (c) financing the expansion programmes of TISCO and IISCO as per the agreements in this regard. Currently, it is ruling at about Rs. 630 per ton on the average. The following increases were effected in the period of the Second Plan:

1956-57	
All categories of steel . .	By Rs. 25 per ton from June 11, 1956 as a consequence of the introduction of uniform selling prices.
1957-58	
Prime quality steel . .	By Rs. 70 per ton from 16th May, 1957 to cover primarily the increase in retention prices granted to main producers.
Tin Plate	By Rs. 100 per ton from 6th July, 1957.
Defectives and re-rollable scraps.	By Rs. 60 per ton from 3rd August, 1957.
Industrial Scrap . . .	By Rs. 50 per ton from 3rd August, 1957.
Sheet cuttings . . .	By Rs. 20 per ton from 3rd August, 1957.
1959-60	
Wire and wire products .	By Rs. 12·5 per ton on account of increase in rail freight payable by the producers.
1960-61	
Black sheets . . .	By Rs. 120 per metric ton from 2nd February, 1961.
Galvanised Sheets . .	By Rs. 33 per metric ton from 2nd February, 1961.
Tinplate	By Rs. 14 per cent consequent on the levy of an excise duty in March, 1960.
Coir baling hoops . .	By Rs. 98 per ton.
Jute baling hoops . .	By Rs. 27 per metric ton on 4-2-'61 and by Rs. 15 per metric ton on 10-6-'61.
Wire and wire products .	Reduced by Rs. 2·5 per ton.
Annealed Wire tested and galvanised.	Increased by Rs. 15 and Rs. 17 per metric ton respectively w.e.f. 22-7-'61.

*Retention of standard grade HMI is Rs. 206·2 but average of all the 14 grades comes to Rs. 189·23 plus excise duty @ Rs. 10.16 per ton.

Capital Investment and Financial Arrangements.—On the basis of preliminary project reports, a provision of Rs. 425 crores was made for the three public sector steel plants, their townships, ore mines and quarries when the Second Plan was drawn up. Similarly, the gross investment of the main producers in the private sector was estimated at Rs. 116 crores in 1956-61. The first detailed estimates of Bhilai, Rourkela and Durgapur available by the end of 1956 showed the revised investment requirement as Rs. 559 crores exclusive of escalation. The latest estimate of the actual outlay on these three steel plants and ancillaries including escalation amounts to about Rs. 620 crores. This excludes the cost of Fertilizer Plant and Pipe Plant at Rourkela as well as coal washeries. The further rise in costs as compared to the 1956 estimates has been explained as primarily due to increase in the quantities of work and escalation. Similar divergences between actual outlay and the project cost estimate have occurred in the case of TISCO in the private sector. The actual investment on its expansion programme has increased by about Rs. 30 crores over the initial estimates.

The foreign exchange expenditure in the Second Plan period upto 31st March, 1961 on the three steel plants and their ancillaries is now estimated at Rs. 290·92 crores as against Rs. 299·64 crores envisaged in 1956. This was met to a large extent from the USSR and UK credits for the Bhilai and Durgapur projects respectively and from the West German credit of Rs. 75·0 crores to the Government of India. The latest estimate of the foreign exchange expenditure of TISCO and IISCO for 1956-61 is Rs. 106·48 crores. The World Bank loan of Rs. 70 crores helped in covering most of the expenditure.

As regards the pattern of financing the projects, the HSL was provided with funds by Government in the form of share capital of the Company and by way of loans. The share capital of Rs. 300 crores was fully subscribed by March 1959. In regard to the loans advanced by the Government (this figure stood at Rs. 306·10 crores on 31st March, 1961), it has been decided that they would be interest free upto 31st March, 1962 and bear interest at 5 per cent per annum with effect from 1st April, 1962.

The actual implementation of TISCO's programme has imposed a heavier financial strain on the company than envisaged. This stemmed partly from the increase in the outlay over what was envisaged earlier and partly from the shortfall of production as compared to the estimates worked out by the Tariff Commission in 1955. The expectation that Rs. 13·28 crores would become available for financing the expansion programme on the basis of the retention price allowed did not materialise and introduced a major distortion in the pattern of financing visualised for this single major investment programme of the private sector under the Second Plan.

From 1st July, 1958 payment of interest charges at 5 per cent became effective on the loan of Rs. 20 crores sanctioned in 1953 by the Government from the Equalisation Fund for financing the expansion programme of TISCO and IISCO. This was based on the recommendation of Tariff Commission which was accepted by the Government. However, Government postponed the recovery of such interest until after March, 1960 and consequentially no allowance of a special element for this purpose was made in the retention price.

Personnel and Training Programmes.—The crucial nature of the problem of personnel for the public sector steel plants was recognised even in the initial phases of planning and the agreements concluded for the construction of Bhilai and Rourkela Plants included a provision for training of key personnel in the design, maintenance and operation of the different sections of these highly integrated undertakings. Preliminary estimates of the requirement of personnel for the three plants were :

120 experienced engineers to be entrusted with higher technical direction ;

1,200 qualified engineers ;

10,000 skilled workers of different categories ;

7,000 semi-skilled workers.

In regard to the private sector plants, it was envisaged that by and large the surplus labour would be fully absorbed and the additional requirements would be marginal.

The latest estimate of combined personnel requirements for the operation of the three Government steel plants are 2,000 senior and junior engineers—the number of senior engineers within this total is about 350—and approximately 19,000 skilled workers and operatives. Owing to paucity of experienced steel experts to man the higher supervisory posts for the operation as also for the maintenance of the plants, a high proportion of foreign personnel have had to be pressed into service until the initial stages of operation are over.

Arrangements for training of engineers abroad and the skilled workmen and operatives in the leading industrial establishments in India were made by H.S.L. in the last five years. Valuable assistance was received in connection with these training programmes from the Governments and friendly organisations in U. S. A., U. K., U. S. S. R., West Germany, Australia and Canada as well as from the U. N. Technical Assistance Board. The steel works in the private sector, especially TISCO, were also most helpful.

The break-up of data concerning engineers and operatives sent abroad for overseas training by the end of 1960-61 is indicated below :

	Engineers (Nos.)		Operatives (Nos.)	
	Sent abroad	Returned	Sent abroad	Returned
U.S.A.	576	372	4	4
U.K.	277	216	56	18
U.S.S.R.	371	329	384	356
West Germany	124	123	7	7
Australia	66	44	10	7
Canada	1	1	..	..
TOTAL	1,415	1,085	461	392

The H.S.L. set up technical training institutes at Rourkela and Bhilai and is organising one at Durgapur. Special metallurgical courses were arranged at some of the leading technological institutions in the country.

The personnel employed in the operation of the Government steel plants at the end of 1960 was as follows:

	Bhilai	Rourkela	Durgapur
Foreign experts	199	66	61
Indian personnel	8,786	11,540	9,939

The training of personnel is also extended to young graduates (non-technical) to be absorbed as junior administrative officers. H.S.L. have recruited 76 persons under this category and arranged for their training within the country.

Problems of the Main Producers.—The most important problem of the steel plants in the public and private sectors since 1959 when the newly established capacity was brought into operation related to raw materials. Due to inadequacy of preparatory studies, a few raw materials reckoned upon from nearby sources of supply were found to be unsuitable *e.g.* Korba coals for blending in the case of Bhilai and blast furnace grade limestone in the case of Rourkela. This led to a lengthening of transport leads from other sources of supply and added to the strain on the railway transport. The high ash content of metallurgical coals and inferior quality of limestone as well as the continuing variability of the impurities in their daily supplies reacted adversely on maximising output and also on effective control of the operating conditions. The time-lags in the implementation of the washeries planned by the HSL and the operational difficulties at the Bokaro/Kargali washery delaying the achievement of its capacity output had reduced the availability of washed coals and affected iron production.

While in addition to the Kargali washery with its capacity of 1·6 million tons of washed coal for Rourkela and Bhilai, the captive washery of the Durgapur steel works (capacity 0·8 million tons of washed coal) has also been commissioned by the end of the Second Plan, the three new independent washeries of the HSL were only in varying stages of implementation and expected to go into production as shown below :

Washery of HSL	Total cost including ancillaries (Rs. crores)	Foreign exchange cost (Rs. crores)	Capacity in terms of washed coal (million tons)	Schedule for start-up
Dugda (for supply of washed coal to Bhilai and Rourkela).	6·98	2·52	1·8	Dec. 1961
Bhojudih (for supply of washed coal to TISCO).	3·48	1·00	0·9	middle of 1962
Pathardih (for supply of washed coal to IISCO).	6·75	1·86	1·3	third quarter of 1963

The full operation of the by-product plants was hampered on account of the lack of internal demand for benzene and some of the tar distillation products. This was due to the setback in the time schedules of schemes like the synthetic rubber project and the organic intermediates project.

Whereas the rolling of the metric sections recommended under the steel economy programme of the Indian Standards Institution has been taken up by the steel plants, the customers have not been fully ready for the change-over. This has given rise to certain temporary problems of production and marketing.

Advisory bodies

(i) *Iron and Steel Advisory Council.*—An Iron and Steel Advisory Council was constituted in November, 1959, to advise Government on all matters of a general character relating to iron and steel and in particular to problems pertaining to production, distribution, transport, research, import and export.

(ii) *Standing Committee on raw materials for the Steel Industry.*—A Standing Committee on raw materials for the Steel Industry was constituted in October, 1960, to continuously study and advise Government on problems, short term as well as long term, relating to the production, supply and movement of coal, iron ore and other raw materials for the Steel Industry.

(iii) *Standing Committees (Trade) for the Steel Industry.*—This Committee was constituted in July, 1961, to study and advise Government on problems, short term as well as long term, relating to the trade in iron and steel.

Lessons from the Second Plan.—The experience of construction and operation of the steel plants in the last five years has shown that advance planning of a very detailed character is of the highest importance under this industry if abnormal variations from the programme schedules and from the investment and production cost estimates are to be kept within reasonable limits. The planning has to cover investigations into raw materials, water supplies, site conditions, transport arrangements and project engineering and would call for co-ordinated effort on the part of many agencies. It has also underlined the fact that in reckoning upon the benefits from such highly integrated plants, due allowance would have to be made for appropriate gestation periods on a more realistic basis.

II. Programmes of Development in the Third Plan:

Approach to Planning for Steel.—Iron and Steel are developmental commodities whose use is almost universal. They are the basic requirements of a growing economy and account for a significant percentage of expenditure on capital investment under different sectors and by way of raw materials of the industrial economy. To meet these requirements from imports would impose a serious strain on foreign exchange resources and the process of development itself would be retarded as a result. From the point of view of the availability of the principal raw materials, iron ore, metallurgical coal and limestone, the conditions are favourable in India for a rapid growth of

the iron and steel industry not only for meeting the internal demands but also for exports outside. The position in regard to further developments under iron and steel, based on the break-through accomplished under the Second Five Year Plan has therefore been regarded as an opportunity and a challenge. On the successful accomplishment of the tasks set for this industry over this decade—the target for 1970-71 is tentatively suggested as 18 to 19 million tons of steel ingots—would depend the resilience and growth potential of the Indian economy.

Estimate of requirements.—Planning in the short term, *i.e.*, with reference to the Third Five Year Plan, has to take due note of the lessons from the Second Plan, on the one hand and the forecasts of demand for 1965-66 on the other. Considerable thought has been given in the country during 1959 and 1960 to both these aspects by various agencies, governmental as well as private. An important study into the appraisal of the steel demand by the end of the Third Plan and by 1970-71 was carried out by the National Council of Applied Economic Research at the instance of the Council of Scientific and Industrial Research. The Planning Commission had the question of future demand for steel examined by a special Working Group on steel consisting of experts from Government and also by consultation with the Hindustan Steel and the main producers in the private sector. The demand estimates were again gone into after a clearer picture of the outlays under the different sectors, particularly the railways, became available after the publication of the Draft Outline of the Third Five Year Plan. The demand estimates for iron and steel, as finally accepted for the Third Plan, are 7·3 million tons of finished steel and 1·5 million tons of pig iron for sale. A basic assumption made in connection with this demand forecast for steel is that the current selling price of steel will hold good for the Third Plan period. The category-wise break-up of the demand for steel, which has provided the background for the planning of production of the different end-products is indicated below along with the figures of the installed capacity available at the start of the Third Plan.

Category-wise break up of the demand for Iron & Steel

('000 tons)

End product of steel	Estimated demand by 1955-56	Capacity in existence in early 1961
1	2	3
Heavy rails and fishplates	400	345
Heavy structurals and broad flanged beams	550	445
Sleepers and crossing sleepers	200	180
Medium & light structurals	550	680
Rounds and flats including rounds for nuts, bolts and screws	2,200	1305
Tin plate	300	150
Plates 3/16″ and up	650	300
Wires including wire ropes	400	220

1	2	3
Hoops and box strapping	50	45
Sheets	1,200	740
Strips & skelp for tubes	400	188
Forging blooms and billets	300	132
Wheels, tyres and axles	100	30
TOTAL	7,300	4,760
Pig iron for sale	1,500	660-870

Expansion of capacity for pig iron and steel.—Planning of capacity for iron and steel has been proposed under the Third Plan mainly in the public sector. In relation to the steel target kept in view *viz.*, 10·2 million tons of ingots, the share of the private sector is placed at 3·2 million tons in 1965-66 as compared to 3·0 million tons of TISCO and IISCO at the start of the Third Plan. The addition of 2 lakh tons of ingot capacity in the private sector is expected to come from the installation of scrap-based electric furnaces which will augment the supplies of billets to re-rollers. The supply of billets from the main producers of steel is visualised at 1·0 million tons by the end of the Third Plan. As regards pig iron, the supplies for the market from the private sector are provisionally placed at about 0·3 million tons to be achieved through expansion of iron making capacity based on low shaft blast furnaces, electric smelting of iron ores and/or the more recent process developed in U. S. A. *e.g.*, Strategic Udey Materials process and R. N. Process. The relaxation of the industrial policy to permit the establishment of pig iron plants upto a lakh tons capacity each per annum is expected to assist in the installation of viable units.

Public Sector Programmes.—Rapid achievement of capacity output from the new steel plants, will be the most important task of the public sector in the initial years of the Third Plan. The share of the public sector within the overall target for steel is 7·0 million tons. This capacity for steel ingots as well as additional supplies of pig iron for sale are proposed to be realised through new developments included in the Plan, comprising the expansions of Bhilai, Rourkela and Durgapur Steel plants and the Mysore Iron and Steel Works and the establishment of a new steel plant at Bokaro. In addition, there is included in the plan a project for a pig iron plant based on low shaft blast furnace techniques and use of coke from the Neiveli lignite. The levels of capacity to be reached under these programmes are:

(million tons)

	Target Capacity	
	Steel Ingots	Pig Iron
(a) Expansion of—		
Bhilai	2·5	0·3
Rourkela	1·8	..
Durgapur	1·6	0·3
Mysore Iron & Steel Works	0·1	..
(b) Bokaro Steel Project	1·0	0·35
(c) Neiveli Pig Iron Project	..	capacity still to be decided.

The expansion of Bhilai, Durgapur and Rourkela Steel Plants proposed for the Third Plan will lower the investment from about Rs. 2,000 to 1,500 per ton of finished steel.

The Neiveli pig iron project on which considerable preliminary investigations have still to be conducted in regard to the process as well as raw materials intended to be used, represents an intermediate stage towards the establishment of a steel plant of about 0·5 million tons in the southern region. The financial provision included for this scheme in the Third Plan covers mainly the requirements of high temperature carbonisation plant for the production of lignite coke.

The expansion programme of the Mysore Iron & Steel Works comprises mainly the spill-over expenditure on the ferro-silicon plant and provision for steel making by the L. D. process and for light structural mill.

The lay-out of the new steel plant at Bokaro is being planned for a capacity of 2 million tons of steel ingots but in the first phase of development, it is proposed to instal facilities for the production of 1·0 million tons. This plant is expected to specialise in the production of different types of flat products still in deficit on the basis of the end-products planning recommended under the expansion programmes of Bhilai, Rourkela, and Durgapur discussed below. The exact types of flat products to be produced at Bokaro in the first phase and the nature of the finished facilities to be provided therefore were actively under examination at the commencement of the Third Plan.

End-products Planning.—An important aspect of steel planning under the expansion programmes of Bhilai, Rourkela and Durgapur relates to the establishment of the finishing mill facilities on the scale required for rolling the ingots produced and consistent with the diversification and specialisation of finished steel production feasible under each unit on the basis of making full use of the facilities already created. In November, 1959 a Committee designated 'Coordination Committee on Steel Planning' was set up by the Department of Iron & Steel to examine this question from all aspects including the estimates of investment and foreign exchange requirements. The report submitted by the Committee on the nature of expansions at the three steel plants, which was accepted by Government, has proposed the expansion of production of different end-products of saleable steel as outlined below :

End-products proposed for manufacture under the expansion schemes of the Steel Plants of HSL.

(Capacity for finished steel in '000 tons)

	Bhilai		Rourkela		Durgapur	
	Existing	After expansion	Existing	After expansion	Existing	After expansion
1	2	3	4	5	6	7
A. End-Products of Steel						
Heavy rails	100	500	..	..	..	..
Fish plates	..	..	..	..	11	11
Heavy structurals and broad flanged beams.	265	250	..	..	..	..

1	2	3	4	5	6	7
Sleepers and Crossing sleepers	..	..	..	..	60	75
Medium and light structurals	255	500	..	..	200	200
Rolled Wire (from Wire Mill)	..	300	..	..	240	240
					(Merchant Bars)	
Tin plate	..	..	50	150	..	..
Plates 3/16" and up	..	..	200	280	..	..
Hot rolled and ships sheets	..	..	300	300	..	..
Electrical steel sheet	..	..	..	50	..	..
Cold rolled strips	..	..	170	300	..	..
Galvanised sheets	..	..	..	160	..	..
Skelp for tubes	..	..	..	..	..	250
Forging blooms and billets	..	..	..	..	100	70
Wheels, tyres and axles	..	..	..	..	50	93
Billets for sale	150	400	..	..	150	300
TOTAL	770	1,950	720	1,240	811	1,239
B. Pig Iron for sale	300	300	..	..	360	300

The production of electrical steel sheets planned at Rourkela does not cover the grain-oriented variety. A scheme for taking up the manufacture of this product is under examination by the HSL. It has not so far been included in the Plan.

Production targets.—Based on preliminary forecasts of the time schedules for the commissioning of new capacity planned for establishment in the Third Plan period as outlined above, the targets for the production of saleable steel and pig iron have been visualised at 6·8 million tons and 1·5 million tons in 1965-66. The total production of saleable steel during the Third Plan period is tentatively estimated to be of the order of 24·1 million tons inclusive of an output of 0·3 million tons from the Bokaro Steel plant in 1965-66. The annual break-up of production is visualised as follows :

Estimate of finished steel production

	(million tons)
1961-62	3·5
1962-63	4·0
1963-64	4·3
1964-65	5·5
1965-66	6·8
TOTAL	24·1

On the basis of the above forecast of production and of the tonnages of different end-products likely to be available, shortages are expected to be significant, particularly in the initial years of the plan period, in the case of flat products *e.g.*, tin plate, sheet, skelp and plate. This will call for the formulation of a scheme of priorities for determining the quantum of imports and allocation of flat products to different classes of consumers. *Prima facie*, it should be possible to narrow down the margin between the demand

and the indigenous supply of steel products in short supply by free interchange of steel ingots between the public sector plants so as to achieve the most intensive use of the rolling mill facilities for flat products. This possibility should receive attention in production planning in the light of the situation that may obtain from year to year.

Investment and Employment.—The overall investment on the iron and steel development programmes inclusive of those of the secondary producers and re-rollers is estimated at Rs. 640 crores involving a foreign exchange element of Rs. 305 crores. Of this total investment, the outlay under the public sector is expected to be Rs. 525 crores with the following break-up :

	(Rs. crores)
Spill-over expenditure from the Second Plan on the three steel plants	32·0
Expansion of	
Bhilai	138.0
Rourkela	90·0
Durgapur	56·0
Mysore Iron & Steel Works	8·0
Bokaro Steel Plant	200·0
Steel rolling mill in Madras	1·0
TOTAL	525·0

The overall investment in the public sector is inclusive of the expenditure needed for increasing the production of limestone at Nandini and iron ore at Dalli Rajhara and Barsua in the case of the expansion programmes. It also includes the investments required for additional production of coal and iron ore for the Bokaro Steel Plant and the expenditure on townships at all the four steel works. On the basis of the aggregate production of steel estimated at 24·1 million tons, it has been envisaged that the Hindustan Steel Limited would be able to contribute from its internal surpluses a sum of about Rs. 130 crores for financing its development programme.

The foreign exchange for the expansion programmes of the three public sector steel plants, estimated at Rs. 133·0 crores, has been arranged under credits offered by USSR, U. K. and West Germany for the Third Plan. Similar arrangements for the Bokaro steel plant are yet to be made. In the meanwhile, preparatory steps on this project have been taken in hand. The association of Messrs. Dastur and Co., who have prepared the preliminary project report for the Bokaro Steel Project in 1959 is envisaged in the progressing of this project by the Hindustan Steel Limited.

The requirements of technical personnel for the HSL during the Third Plan period are provisionally estimated at about 1,400 engineers, 1,900 diploma holders and 12,000 skilled workers. Most of the personnel will be trained in India and training abroad would be confined to only those who have to learn advanced techniques.

Apart from the operational needs of the steel plants, the planning of technical personnel by the HSL has to keep in view the demands of the designs development and project engineering section at its headquarters in Ranchi. By the end of Third Plan, technical personnel would also be required in connection with the responsibilities to be assumed for the erection and commissioning of the steel plant equipment produced by the Heavy Engineering Corporation and the Heavy Electricals.

Raw Materials and Power.—The experience of the Second Plan on the steel front has to be avoided by thorough preliminary planning and close dove-tailing and co-ordination of the schedules of construction of the plants proper and of the programmes in the related fields. In this context, the magnitude of the task is quite enormous. The requirements of raw materials, coal, iron ore, limestone and dolomite *vis-a-vis* the capacity of 10·2 million tons of steel ingots and 1·7 to 1·8 million tons of pig iron, inclusive of the internal consumption requirements within the steel plants, are envisaged as follows :

Demand for Principal Raw Materials

	Estimated consumption in 1960-61	Requirements *vis-a-vis* capacity planned for 1965-66
	(million tons)	
Iron Ore	6·93	19·6
Coal	7·55	27·0*
Limestone	2·05	6·2
Dolomite	0·51	0·65

The strain of the demand for raw materials will be relieved to some extent through the installation of sintering plants at Rourkela and Durgapur and the use of undersized coke and iron ore fines in preparing the sintered charge for the blast furnaces. The problem of supply of washed metallurgical coals to the steel plants is crucial. The production of additional metallurgical coal and expansion of washing capacity have been projected as follows:

Field-wise distribution of additional production of coking and blendable coal in the Third Plan

Bengal—Bihar :	Coking coal (million tons)
Raniganj	0·35
Jharia	5·84
Bokaro	1·68
West Bokaro	0·50
Ramgarh	1·50
TOTAL	9·87
	Blendable coal (million tons)
Raniganj	1·62
Charcha-Jhilmili (M.P.)	0·50
TOTAL	2·12

*The requirement of coal are liable to revision depending on the yield of clean Coal in actual practice.

The position obtaining at the end of the Second Plan in regard to the establishment of washeries *vis-a-vis* the Second Plan iron and steel targets, has been explained earlier under "Problems of the Main Producers". In connection with expansion of iron & steel production programme under the Third Plan the requirement of additional washing capacity is tentatively placed at 12·7 million tons in terms of raw coal. This is proposed to be established by the doubling of the Dugda and expansion of the Bhojudih washeries accounting for 3·2 million tons of coal and the establishment of new washeries as given below :

	(million tons)
Kathara	3·0 (coal from Kathara and Jarangdih mines).
Karanpura	2·8 (coal from the mines working Argada and Sirka seams).
Ramgarh	1·5 (coal from Ramgarh mines).
Kargali extension	0·5 (coal from Sawang and Chalkari mines).
Sudandih	2·2 (coal from Sudandih mines; only 0·5 million tons working capacity is expected to materialise during the Third Plan period).
Jhillimili	0·8 (coal from Jhillimili Coal mine).

As an alternative to a part of the new washery capacity, expansion of the washery attached to Durgapur Steel Works is also being examined.

Another problem vitally linked with the steel programme, particularly of Durgapur and Bokaro, relates to supplies of limestone and dolomite. Current expectations are that the limestone would have to be moved from the Satna-Maihar area in Madhya Pradesh. Possibilities of getting supplies from other sources situated in Bihar and Uttar Pradesh are also being explored.

The raw materials problem is being examined from the angle of arrangements for their mining and extraction as well as of railway transport facilities from the various supply points to the different steel plants. Return traffic facilities are proposed to be utilised by the coal wagons for Rourkela being used for moving iron ore to the Bokaro Steel Plant.

While the supply of electric power would be mainly arranged from external sources, the standby capacity in the steel plants is also proposed to be increased as follows:

	Existing capacity	After expansion
	('000 Kw.)	
Durgapur	15	15
Rourkela	75	125
Bhilai	24	36

B. Re-Rolling Industry

According to the old classification still current, the re-rolling industry, which makes use of billets, semis and scrap as its starting raw material for the production of finished steel, comprises secondary producers, registered re-rollers and unregistered re-rollers. There is no distinction between registered re-rollers and secondary producers except that the latter have made larger investments and their scale of operations is higher and covers a wider range of rolled products and light structurals. The main distinction between registered and un-registered re-rollers is in regard to the allotment of billets which is normally restricted to the former in the event of short supplies. Further, registered re-rollers are predominantly organised as public limited companies in contrast to the proprietary basis of organisation of most of unregistered re-rollers. The firms operating as secondary producers are: M/s. Tinplate Co. of India, M/s. Indian Steel and Wire Products (ISWP), M/s. Guest Keen Williams Ltd., M/s. Eagle Rolling Mills and M/s. Indian Steel Rolling Mills.

(i) *Secondary Producers*

1. Review of Progress in the Second Plan:

Though the two major manufacturers of pipes—M/s. Indian Tube Company and M/s. Kalinga Tubes—were dealt under "secondary producers" in the Second Plan, they have been covered in this Volume under the "Pipes and Tubes Industry".

The major expansion schemes of the secondary producers referred to in the Volume on the Programmes of Industrial Development, 1956-61, were the proposal of M/s. Tinplate Company of India to increase the tinplate output from 80,000 tons to 110,000 tons per year which was still under Government's consideration in early 1956 and the programme of M/s. Guest Keen Williams, under implementation for increasing its works capacity for bars and rods by 42,000 tons per year. As regards progress on the first proposal, a revised scheme for the expansion of tinplate output was put forward for industrial licence in 1960 by M/s. Tinplate Company, which was approved. According to this proposal, the capacity of the Golmuri plant would be expanded from its current level of 70,000 tons to 160,000 tons in two stages—70,000 tons extra in the first phase and a further, 20,000 tons in the second phase. The first phase would involve an addition of about 70,000 tons per annum of cold reduction capacity in the rolling mills with complementary additions to the finishing and tinning equipment. In the second phase, the existing hand-mills are proposed to be replaced by a second cold reduction unit which would bring about a net addition of 20,000 tons to the existing capacity by this modernisation and expansion process. Half of the total tinning capacity would be electrolytic-based on the completion of the expansion programme which is estimated to involve an overall fixed investment of Rs. 11·95 crores. The foreign exchange element of this investment would be about Rs. 6·8 crores. At the end of the Second Plan, the company has been engaged in examining the methods of raising the resources including foreign exchange for implementing the project. On the completion of the second phase, hot-strip steel will completely replace tin bar as the raw material.

The expansion scheme of M/s. Guest Keen Williams Ltd., for the manufacture of 42,000 tons of bars and rods per annum on a three shift basis was completed by May, 1961. The scheme consisted of the installation of a cogging and medium bar mill and a 16"/12"/10" bar-*cum*-rod mill together with a continuous rod train. The cogging mill was commissioned in January, 1960 and it was in full production on two shifts basis along with the 16" bar mill by June, 1960. By the end of 1960, the commissioning of the bar-*cum*-rod mill was completed and the scheme was fully implemented with the commencement of operations by the 10" continuous rod train. The commissioning of the different mills was more prolonged than was expected on account of the length of time taken to train the mill crew transferred from the oldhand rolling mills in handling mechanical controls. The output of the company remined more or less stationary round about 45,000 to 50,000 tons per year in the Second Plan period and the full benefits of the expansion programmes, which involved Rs. 3·1 crores of fixed investment, are expected to be realised by 1963.

The third major secondary producer in the country, M/s. Indian Steel & Wire Products Ltd. (ISWP) was licensed in 1958 for carrying out modernisation and expansion programmes covering, the installation of a new wire rod mill. On the completion of this programme, ISWP will have a capacity for 160.000 tons of wire rods as compared to the current level of 120,000 tons per year. Production of rods for sale would be regulated at the same level as now *i.e.* 25,000 tons per year and the rest of the output will be consumed internally. The investment on this new mill is estimated to be Rs. 2·5 crores out of which the foreign exchange cost of the programme is estimated at Rs. 2·0 crores.

The production of finished steel by the secondary producers comprises small tonnages of light structurals, rails, fish plates and hoops and strips. On the other hand, the production of rods and bars, tinplate, wire and wire-products and spring steel is a substantial proportion of their total output. Their total output of finished steel remained more or less stationary during 1956-61 round about two lakh tons per year.

II. Programme of Development in the Third Plan:

Apart from the spill-over programmes of M/s. Tinplate Co. of India and M/s. ISWP outlined above, no major developments are envisaged by the secondary producers in the Third Plan period. The estimate of spill-over investment on these programmes is about Rs. 10·0 to Rs. 10·5 crores.

(ii) *Other Re-Rollers*

I. Review of progress in the Second Plan:

Targets.—The capacity of the 142 re-rollers—20 registered and the rest unregistered—was assessed at about 719,000 tons per year on three-shifts basis by the Iron and Steel Controller. The estimate of the industry was much higher. In accordance with the policy of the Government that the creation of new units in the re-rolling industry should not ordinarily be encouraged in view of the wide gap prevailing between the installed capacity and actual production, the Second Plan emphasised mainly the production aspect and improvements of plant equipment and operational techniques for

this sector. The main impediment in the way of stepping up the production was expected to be eliminated by improved availability of billets and semis from indigenous sources. To this end, provision was made within the steel expansion programme of the main producers for 700,000 tons of billets and semis for sale.

In July, 1956, a Committee was appointed by the Government to study the problems of the electric furnaces, foundries and re-rolling mills in the country with reference to (a) raw material requirements and the kind of expansion that is feasible *vis-a-vis* the conclusions about raw material availability in the future, and (b) methods of improving their efficiency to make them independent of any form of subsidy on the raw material prices. The Committee was also asked to assess the requirements of additional capacity in the light of developments taking place in other sectors of the economy and indicate suitable locations for the new units that may be set up keeping in view the importance of promoting regional development and other relevant considerations.

In its report submitted to Government in April, 1957 the Committee estimated the capacity of all the re-rollers operating in the country (including secondary producers) at 700,000 tons on single shift. Further, it observed that the States of Andhra, Assam, Bihar, Himachal Pradesh, Jammu & Kashmir, Madras (including Pondicherry), Madhya Pradesh, Mysore, Kerala and Orissa were deficient in re-rolling capacity and suggested that new capacity should be established in these States to fill the gap locally as far as possible. The Government resolution on this report was published in November, 1957. On the question of fresh re-rolling capacity, the view taken by Government in this Resolution was that there was no case on merits for any new units except in areas which have no or little capacity currently and which might justify the location of new units on considerations of convenience of transport and economic production. In the last two years of the Plan, licences were given for new re-rolling mills, one each in Assam, Andhra Pradesh, Kerala and Bihar (north of Ganges). The Third Five-Year Plan has provided for the establishment of a re-rolling mill in the public sector in the Madras State. The following are the particulars relating to the new re-rolling mills licensed for establishment :

New re-rolling Mills Licensed

Name	Production capacity (tons per annum)
M/s. Andhra Steel Corporation (P) Ltd. Vizakhapatnam.	M.S. Rods (½") 4,800.
M/s. Kumar Iron and Steel Co. Ltd., Gauhati .	Rounds flats angles, hexagon channels, half-rounds 6,000
M/s. North Bihar Rolling Mills, Ltd., Bihar . .	M.S. Rods (rounds & squares flats light angles 14,400 (2 shifts).
M/s. A. V. Thomas & Co. Ltd., Cochin . .	Bars, rods & gate channels 6,000 (revised).

At the end of the Second Plan, the number of registered re-rollers operating on billets was 63 as against 20 in 1955. Other re-rollers using scrap as the raw material, numbered 81. The production of finished steel was shared as follows by the different producers between 1956 and 1960.

Relative shares of the total production of finished steel ('000 tons)

	Main producers	Secondary producers	Registered re-rollers	Un-registered re-rollers
1956	844	204	217	73
1957	865	205	212	64
1958	804	194	215	51
1959	957	206	285	93
1960	1,300	212	565	131

The improved operating performance of the re-rolling industry in 1959 and 1960 was due to the larger availability of billets for sale from the main producers. The supply of billets and semis in the last year has been well above the Plan expectations of 7 lakh tons for 1960-61.

The registered re-rollers operate on billet supplies from the main producers as well as electric furnace billets. The more important among them produce electric furnace billets within their own establishments. Electric furnace billets are also produced by some establishments to be sold for conversion to bars and rods by the re-rollers. Since the selling prices of the different end-products of steel are controlled, the conversion charges payable to the re-rollers as well as the retention price for electric furnace billets are fixed by Government on the basis of the advice given by the Tariff Commission. An enquiry into this question made by the Tariff Commission with reference to the period beginning with 1957 and its report was submitted to Government in June, 1958. The conversion charges allowed by Government to the registered re-rollers for untested bars and rods 5/8" and above are as follows :

Rs. 122 per ton from 1st January, 1957.

Rs. 133 per ton from 16th May, 1957.

Rs. 130 per ton from 3rd August, 1957.

Rs. 131 per ton from 1st January 1958 to 31st December, 1960.

The fair ex-works retention price payable to the registered re-rollers for electric furnace billets, untested category, was fixed as follows :

Rs. 369 per ton from 1st January, 1957.

Rs. 410 per ton from 16th May, 1957.

Rs. 411 per ton from 8th July, 1957.

Rs. 409 per ton from 3rd August, 1957.

Rs. 413 per ton from 1st January, 1958.

Rs. 415 per ton from 1st February, 1958 to 31st Dec., 1960.

II. Programme of Development in the Third Plan:

From the latest assessment of installed capacity of the re-rollers, the problem in the Third Plan is not really one of further expansion of production facilities though, as already explained, a marginal increase in capacity is being envisaged to secure re-rolling facilities in selected areas. In order to assist the re-rolling industry with raw materials, the Third Plan provides for the production for sale of 1·0 million tons of billets at the integrated steel works. Expansion of production of scrap-based electric furnace billets has also been envisaged upto 200,000 tons by 1965-66. In utilising these opportunities for expansion of production the re-rollers should, *inter alia*, give attention to the manufacture of special varieties of mild steel like low alloy steels, spring steels and free cutting steels. The combined demand for spring steels and free-cutting steels is estimated at 75,000 tons in the last year of the Third Plan.

Increase in the production of electric furnace billets from the 1960 level of about 40,000 tons to the two lakh tons target would lead to a substantial step up of the demand for electric power apart from the additional investment involved in creating the new electric furnace capacity. For the targetted production of electric furnace billets, the requirements of electric power are estimated at 50,000 KW in 1965-66.

The overall investment on the development programmes of the re-rollers (other than secondary producers and exclusive of the investment on modernisation of the existing units) is placed at Rs. 20 crores in the Third Plan. It also includes the investments on building up the additional electric furnace capacity.

ANNEXURE I

Main features of the new Steel Plants and expansion completed in the Second Plan

	Tisco	Iisco	Rourkela	Bhilai	Durgapur	Misw
1	2	3	4	5	6	7
1. Coke Ovens		5 batteries of 40—78 ovens each.	2 batteries of 70 ovens each have been commissioned ; the 3rd battery though completed in the Second Plan period has not yet been commissioned.	3 batteries of 65 ovens each and chemical shops.	3 batteries of 78 ovens each.	One wood carbonisation plant.
2. Blast Furnaces.	6 blast furnaces of 6270 tons daily capacity.	2 furnaces of 650 tons daily capacity each; 2 furnaces of 1200 tons daily capacity each.	2 furnaces of 1000 tons daily capacity each have been commissioned ; the third furnace completed in the 2nd plan period has not yet been commissioned.	3 furnaces of 1135 tons daily capacity each.	3 furnaces of 1250 tons daily capacity each.	Two Electric pig iron plants.
3. Steel Melting.	Melting Shop No. 3 1,300,000 tons of steel ingots per month by the scrap blown metal process.	(i) 3 Bessemer convertors with 25 tons capacity.	(i) 2 mixers of 1,100 tons each. (ii) 3 L. D. convertors of 40 tons each.	(i) 6 open hearth furnaces of 250 tons each.	(i) 7 open hearth furnaces of 200 tons each. (ii) one open hearth furnace of 100 tons capacity.	Two electric furnaces, two open hearth furnaces, one ferro-silicon Electric furnace*

1	2	3	4	5	6	7
	(i) 3 convertors of 32 tons capacity each. (ii) 5°H furnaces of 200 tons capacity and 2 of 190 tons. (iii) 2 hot metal mixers of 800 tons each. Steel Melting Shop No. 2 700,000 tons of steel ingots per year. (i) 3 convertors (ii) 3 tilting open hearth furnaces, 2 electric furnaces.	(ii) open hearth furnaces 5 with 225 tons capacity, 1 with 100 tons capacity, 1 with 300 tons capacity.	(ii) 4 basic stationary open hearth furnaces of 80 tons.			
4. Rolling Mills.	(i) Two Blooming Mills No. 1-827,000 tons & No.2-917,000 tons blooms capacity per year. (ii) Two sheets, bars and billet Mills. (iii) Rail & Structural Mill. (iv) Medium & light structural Mill.	(i) One blooming mill. (ii) One continuous billet Mill. (iii) One heavy structural & rail Mill. (iv) One medium and light structural Mill. (v) One merchant and bar mill.	(i) 1 Blooming & slabbing Mill. (ii) 1 Heavy Plate Mill. (iii) 1 continuous strip Mill.* (iv) 1 Pipe plant.	(i) Blooming Mill (45-2") (ii) Rail and Structural Mill (iii) 1 Merchant Mill. (iv) 1 continuous billet Mill.	(i) 1 Blooming Mill (ii) 1 Intermediate Mill. (iii) 1 Continuous billet Mill. (iv) 1 Wheel tyre & Axleplant* (v) 1 Merchant Mill. (vi) 1 Medium Section Mill.	(i) One 20" Mill (1 Staw). (ii) One 16" Mill. (iii) One hoop Mill.

	(v) Sheet Mill (with galvanising pot). (vi) Merchant Mill. (vii) Skelp Mill. (viii) Wheel, Tyre, & Axie Plant. (ix) Plate Mill. (x) Sleeper Press.	(vi) One sheet mill (with galvanising pot).			(vii) 1 Sintering plant.
5. Power Plant.		Two 10,000 KW and two 20,000 KW.	75,000 KW.	24,000 KW.	15,000 KW.
6. Miscellaneous.	One preparation & sintering plant.	Rotary Dolomite Kiln, Lime Kiln.		Sintering Plant.	Captive Coal washery.

*Under construction at the end of the Second Plan.

ANNEXURE II

The retention prices and the selling prices of tested varieties of selected categories of steel, in April, 1956 and May, 1961

Steel Product	Retention price		Controlled selling price	
	April, 56 (Rs. per long ton)	May, 61 (Rs. per metric ton)	April, 56 (Rs. per long ton)	May, 61 (Rs. per metric ton)
Blooms	245	343	385	472
Slabs	245	355	385	472
Billets	270	380	405	502
Rails (heavy) above 14KG	383	496	535	620
Rails (light) 14KG and below	424	531	595	679
Bars and rods (round and squares, 80mm and above and flats over 125mm wide).	356	487	540	625
Bars & rods (rounds & squares below 80 mm & flats upto and including 125mm wide)	369	535	550	635
Structurals	382	519	560	645
Fish plates for light rails	457	569	645	728
Fish plates for heavy rails	540	636 (untested)	718	800
Plates 10mm & up	385(T) 372(U)	505(T)	638(T)	721
Plates, acid (boiler)	573	528	705	731
Black sheets (gauges 3·15 to 2·0 mm)	491	643	580	784
Galvanised corrugated sheets (thickness 0·63 mm. & length 1·8 m to 3·05m).	645	749	735	850
Sleeper bars	267	388	400	487
Tin bars	256	394	395	458
Skelp (tube making)	404	551	650‡	635
Hoe bars	362	472	395	482
Wheels & tyres, acid	758	871	750	807
Wheels & tyres, basic	621	736	650	709
Axles, acid	894	1,005	880	935
Axles, basic (top poured)	723	837	780	837
Axles basic (bottom poured)	751	864	780	837
Sleepers	350*	469†	480*	566†

*Pressed (Rs. 394 and Rs. 510 were the retention and selling prices on 1-4-'56 for 50-60 lbs).

†B. G. for 75 lbs. rail.

‡This rate was provisionally fixed but not enforced.

ANNEXURE III

Import of Iron and Steel into India (in tons)

Products	1956	1957	1958	1959	1960
Pig Iron	57,514	119,266	89,674	67,993	16,384
Scrap, industrial and re-rollable	177,412	66,266	55,468	27,921	3,350
Castings and Forgings	4,813	7,736	938	10,360	11,759
Tool, Alloy and Special Steel including stainless-steel sheets and spring steels.	30,573	25,076	26,013	20,971	23,101
Ingots, billets and sleeper bars	206,879	266,961	220,079	138,641	45,667
Structurals	284,147	202,062	143,327	79,558	61,409
Rails, heavy and light	113,689	165,360	205,831	77,795	177,549
Tinplate, prime, unassorted and waste.	56,576	28,275	45,173	64,055	85,580
Terneplate	845	502	107	133	579
Sheets and Plates including galvanised sheets.	310,622	350,782	105,551	258,399	428,121
Bars and rods	340,997	257,756	87,460	69,082	94,557
Wires, all categories (iron and steel items only).	70,048	53,363	47,136	54,549	79,280
Hoops and strips	33,938	17,868	22,864	28,608	31,753
Wheel, tyre and axles	11,803	38,778	48,351	43,483	71,554
Miscellaneous	17,883	60,956	75,320		
TOTAL	1,717,749	1,661,007	1,173,292	941,548	1,130,643

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2. ALLOY, TOOL AND STAINLESS STEELS

1. Review of Progress in the Second Plan:

Targets.—The allocation of production of different end-products of steel to the main producers under the Second Plan (*vide* page 22 of the Volume on the Programmes of Industrial Development 1956-61) provided for the manufacture at the Mysore Iron & Steel Works of 15,000 tons of stainless steel and 2,000 tons of alloy and tool steel.

Capacity and Production.—The processing of the project for the production of alloy, tool and stainless steel was taken up by the Department of Iron & Steel during the middle of the Second Plan. Preliminary project reports for a plant of 25,000 tons annual output in terms of different finished products were received in 1958 from some of the leading producers abroad. In the re-appraisal of the Plan carried out in 1958, a provision of Rs. 2 crores was made for going ahead with the project for the production of these kinds of special steels. Action on the implementation of this scheme was however delayed as a result of the decision to get a more detailed project report the scope of which was modified in the course of its preparation to facilitate the establishment of a more viable unit in line with the higher levels of demand visualised under the Third Plan. The Consultants entrusted with the preparation of the detailed project report were also asked by the Government for advice in regard to the most appropriate site in the country for setting up a plant for the production of special steels. In their report submitted to Government in July, 1960, the Consultants indicated that the capacity of 48,000 tons per year in terms of finished products proposed by them represented the size of a minimum economic unit and that an early doubling of the plant which was necessary from economic considerations should be kept in view. The plant recommended by them for the first stage would have built-in surplus capacities which could be effectively utilised after expansion. In view of these surplus capacities, the cost of expansion would be cheaper. As regards the location, the Consultants examined the sites and other facilities available near the main Government steel plants at Durgapur, Rourkela, Bhilai and Bhadravathi and recommended in favour of Durgapur. This recommendation was endorsed by a Technical Committe. In November, 1960 Government decided to establish the Alloy Tool Steels plant in the public sector at Durgapur.

The proposals from the private sector had to be held in abeyance until final decisions on the Government plant had been taken, which in turn had to depend on the emergence of a clear picture of the pattern of growth of demand for these products over a decade from the studies entrusted to the Consultants. Thus, due to a variety of circumstances, the progress recorded under this industry was slow and has to be made good in the Third Plan.

The current heavy demand for imports of these high priced but essential raw materials of the engineering industries has proved to be a serious problem on maintenance account.

II. Programme of Development in the Third Plan:

Estimated requirements.—As already explained, in the assessment of demand for mild steel, account has also been taken of the low grade alloy steels, spring steels, free cutting steels and electrical grade silicon steels because these products can be produced by the conventional processes in large integrated steel works or with relatively simple equipment and processes by the re-rollers equipped with electric furnaces. The products requiring specialised equipment and processes for their manufacture and containing higher proportions of alloying elements *i.e.* 0·4 per cent or more chromium or nickel, 0·1 per cent or more of molybdenum, tungsten or vanadium, or 10 per cent or more of manganese, are classified under tool, alloy and stainless steels for the estimation of the demand. The alloying elements referred to do not however exhaust all the elements used for fortifying steel in order to endow it with the special properties in view *e.g.* mechanical strength, hardness and corrosion resistance.

The various estimates of future demand for the tool, alloy and stainless steels made by different agencies in the last two to three years have shown divergences on account of the difference in the definition of these products adopted and the consequent alterations in the coverage of items. The Consultants to Government for the Alloy Steel Project have adopted the scope as defined in the preceding paragraph and also taken into account the disguised imports of alloy steels in the form of components of industrial equipment in estimating the demand and offtake in the last three years of the Second Plan. As regards the future, forecasts were attempted on the basis of the end-product approach *i.e.* working out the consumption requirements *vis-a-vis* specific physical targets and programmes for 1965 and 1970. The demand estimates which have been kept in view by the Planning Commission as a guide for planning in this field are indicated below along with the end-products pattern of the public sector project to be established at Durgapur.

Projection of demand for alloy tool and special steels exclusive of electrical steel sheets, spring steels and free cutting steels

(tons of finished steel)

	1965	1970	Output capacity of the Durgapur Alloy Steel project
Tool Steel	42,000	70,000	13,000
Constructional steels	100,000	241,000	17,500
Stainless Steels	50,000	68,000	17,000
Die and other alloy steels	8,000	10,000	500
TOTAL	200,000	389,000	48,000

Targets for capacity and production.—In view of the heavy and steadily mounting drain of foreign exchange that would be involved in meeting the demands for these high priced products through imports, very high priority has been assigned to the rapid growth of this industry and targets have been set both for capacity and production at 2 lakh tons per year to be achieved by 1965-66. Unless urgent and vigorous action is taken in the initial years of the Third Plan to implement these schemes (for everyone of these the foreign exchange arrangements are yet to be made) the production is likely to lag behind the target set for 1965-66. The implementation of the projected Durgapur alloy steel plant of the Central Government has been entrusted to the Hindustan Steel Limited and M/s. Dastur & Co. are the Consultants for the scheme. M/s. Atlas Steels Ltd. of Canada have been selected as the Production Advisers for this project, which is expected to incorporate some of the latest equipment and processes for the manufacture of the alloy steels developed recently in advanced countries. It is proposed to install electric soaking pits in this plant in preference to gas fired pits. In connection with its further expansion, the desirability of using sponge iron instead of scrap as the starting raw material and of introducing continuous casting facilities are expected to be kept in view though in the current phase of development production has been planned on the basis of drawing supplies of pedigree scrap from the adjoining Durgapur Steel Works. Another feature of this project worthy of note is that it would be capable of producing for the domestic utensil market nickel-free stainless steels on which considerable pilot plant and semi-commercial trials have been reported to have carried out by the National Metallurgical Laboratory, Jamshedpur.

The Ordnance Factories of the Ministry of Defence are expected to function as a second source of supply of alloy steels in the public sector. Approximately 50,000 tons of tool and alloy steels are likely to be available for civilian consumption from these factories.

Developments in the private sector—The production facilities in the private sector will have to be supplementary to the public sector programmes outlined above and aimed at covering the deficits in different categories of alloy steels still outstanding *vis-a-vis* the future demand forecast. In this context, industrial licences have recently been granted for the creation of new capacity as outlined below :

Schemes licensed for the manufacture of alloy steels in the private sector

(in tons)

Name	Location	Capacity Licensed		
		High-grade requiring specialised rolling equipment	Low-grade not requiring specialised rolling equipment	Total
1	2	3	4	5
M/s Tata Iron & Steel Co. Bombay House, 24-Bruce Street, Fort, Bombay-1.	Jamshedpur (Bihar).	42,000	7,000	49,000

1	2	3	4	5
Shri I. M. Pai, 'Alankar', 251, Sion Main Road Bombay-22.	Thana (Maharashtra).	600	..	600
Shri V. Pandurangiah, 5, Dr. Nair Road, Madras.	Madras . .	6,000	1,000	7,000
M/s K. T. Rolling Mills (P) Ltd., Broach Street, Opp. Victoria Docks, Dana Bunder, Bombay-19.	Ambernath (Maharashtra).	12,000	1,200	13,200
Shri P. Shah, C/o. Rajiv & Co., 12, Meghdoot, 2nd Floor, 95B, Marine Drive, Bombay-2.	Ahmedabad (Gujrat).	..	3,000	3,000
M/s Man Industrial Corpn., Near Loco, Jaipur.	Jaipur (Rajasthan).	..	24,000	24,000
Shri D. Balasundaram, 313, Avanashi Road, Coimbatore.	Salem (Madras) .	19,500	30,500	50,000
M/s Punjab Steel Rolling Mills, Old Station, Baroda.	Baroda (Gujarat).	3,600	..	3,600
M/s Textile Machine Corpn. Ltd., Belghuria.	Belghuria (W. Bengal).	19,000	..	19,000
M/s S. P. Iron & Steel Co., 79/7, Latouche Road, Kanpur.	Kanpur (U.P.) .	..	6,000	6,000
M/s Gangadhar Baijnath, 55/115, General Gunj, Kanpur.	Kanpur (U.P.) .	..	19,800	19,800
M/s Guest Keen Williams Ltd., Post Box No. 609, 41, Chowranghee Road, Calcutta.	Howrah (W. Bengal).	..	31,000	31,000
M/s Mahindra & Mahindra Ltd., Hall & Anderson Building, 1st Floor, Park Street, Calcutta-16	Madras . .	15,000	..	15,600
M/s Khandelwal Ferro Alloy, Khandelwal Bhavan, 166, Dr. Dadabhai Naoroji Road, Bombay.	Nagpur .	2,400	3,000	5,400
	TOTAL .	120,100	126,500	246,600

Raw Materials.—Steel scrap, ferro alloys (ferro-chrome, ferro silicon, ferro-manganese, ferro molybdenum ferro-tungsten etc.), nickel pellets, refractories, argon gas and ingot moulds are the major items under raw materials. With the exception of the Central Government plant and Tata's alloy steels project, the other production units in this field will have to be based on market scrap supplies. The quality and composition of scrap are very important for alloy steels production and this is expected to give rise to problems of proper selection and segregation of scrap both inside the works as well as at the important scrap markets in the country. Early thought deserves to be given to this aspect of the problem.

As regards argon gas, supplies would have to be developed arranging facilities for tapping the argon stream in the tonnage oxygen plants being established at centres close to the locations proposed for the alloy steel plants.

The demands for other raw materials arising from the manufacturing programmes for alloy steels have been taken into account in the targets set for industries engaged in their production *e.g.* ferro-manganese, ferro-silicon, ferro chrome and refractories. Nickel pellets and ferro-nickel will have to be imported.

The production of nickel free stainless steel, if undertaken, will give rise to demands for electrolytic manganese and nitrogen gas.

The raw material requirements of the Durgapur Alloy Steel Project are estimated as follows :

	tons per year
Purchased scrap	50,000
Ferro-chromium	9,600
Ferro-silicon	2,000
Nickel	2,500
Ferro-manganese	1,200
Ferro-molybdenum	160
Ferro-Vanadium	120
Cobalt	20
Refractories	7,500
Burnt lime	6,000
Fluorspar	1,500
Petroleum Coke	300
Electrodes	570

Electric Power and Gaseous Fuels.—In the manufacture of alloy steels which are valued for their special qualities, annealing and heat treatment of the materials in the production stage are of crucial importance. For these purposes gaseous and liquid fuels are preferred on account of the facilities of close temperature control which they provide. In situations close to integrated steel works, the alloy steels plants can and will draw upon supplies of coke oven gas. Thus the Government alloy steel plant at Durgapur and the Tata Project will use coke oven gas and the former is expected to reduce the dependence on gaseous fuels through electric soaking pits. Fuel oil and/or lignite char are expected to find use in the case of the other schemes.

As regards electric power, the demand is expected to rise on account of electric furnace load of the steel melt shops and for the rolling operations. The combined requirements of the Durgapur Alloy Steels Project are estimated at 31,000 K. W. In relation to the production target of 200,000 tons of finished alloy steels (equivalent to about 300,000 tons of moltan metal) it is tentatively estimated that the power demand of the steel melting shops and the rolling mill operations will be about 82,000 K. W. and 35,000 K. W. respectively. More precise data will be available when the full details of the projects proposed for implementation are available and their progress must be coordinated with the time schedules of the specific power projects in the different areas of the country which are expected to meet the loads from this industry.

Investment and Labour.—The outlay on the Durgapur alloy steels project is estimated at Rs. 50 crores in all of which Rs. 20 crores would be the foreign exchange element. The tentative forecast of the labour force for the project is 3,990 persons distributed as follows—production departments 2,139; auxiliary departments 1,022; administration and services 379; and general labour pool 450.

The overall investment under this industry in the Third Plan period is estimated at between Rs. 75 crores and Rs. 80 crores and employment potential is reckoned for about 8,000 persons.

The following table summarises the development programme for alloy tool and stainless steels industry in the Third Plan period :—

(tons)

	1960-61	1965-66
Installed capacity	Nil	200,000
Production	Nil	200,000

3. FERRO-ALLOYS

A. FERRO-MANGANESE

1. Review of Progress in the Second Plan:

Target—The Second Plan envisaged targets of 171,800 tons of capacity and 160,000 tons of production for ferro-manganese by 1960-61. The production target was linked with export of one lakh tons of this ferro-alloy. Other recommendations made were that (a) an early view should be taken on the minimum optimum size for ferro-manganese plants so as to assist the future planning of this industry; and (b) that it would be appropriate for Government to consider entering this industry, if any of the approved schemes did not materialise and a gap *vis-a-vis* the targets needed to be filled up. Utilisation of by-product gases in the production of chemicals like methanol was also recommended to be examined in the interest of bringing down the overall cost of ferro-manganese.

Installed Capacity—At the time of the commencement of the Second Plan there was no installed capacity as such but M/s. Tata Iron and Steel Company had been manufacturing ferro-manganese in their blast furnaces intermittently. The capacity for this was estimated to be of the order of 5,000 tons per month for about 3 months in a year. Besides, M/s. Indian Iron and Steel Company also produced intermittently very small quantities of low grade ferro-manganese.

Of the 8 schemes licensed prior to March, 1956 for the manufacture of ferro-manganese two have proved infructuous. The rest of the schemes and the project of M/s Khandelwal Ferro-Alloys Limited licensed in the Second Plan period have gone into production before the close of 1960-61 leading to an annual installed capacity of 157,800 tons as detailed below:

Project	Location	Year of commencement	Annual Capacity at the end of March 1961
			tons
M/s Mysore Iron & Steel Works	Bhadravati	1956	1,800
M/s Tata Iron & Steel Works	Joda	1958	30,000
M/s Electro-Metallurgical Works	Dandeli	1957	12,000
M/s Kambata Industries	Tumsar	1959	30,000
M/s Jeypore Sugar Co. Ltd.	Rayagada	1958	24,000
M/s Shree Ram Durga Prasad	Garividi	1958	30,000
M/s Khandelwal Ferro-alloys Ltd.	Kanhan	1961	30,000
	TOTAL		157,800

Production—Though the production of ferro-manganese has risen with the creation of new capacity during the Second Plan period, it was below the expectations of performance envisaged in 1956. The shortfall in exports

as well as the non-materialisation of indigenous off-take on the scale visualised—this is mainly linked with the production of steel—were chiefly responsible for the lower levels of production actually registered. The comparative data are given below:

(tons)

	Programme envisaged under the Second Plan		Actual growth of capacity & production	
	Annual Capacity	Production	Annual Capacity	Production
1956-57	10,000	5,000	1,800	2,043
1957-58	25,000	25,000	8,800	13,248
1958-59	55,000	50,000	85,800	51,351
1959-60	105,000	70,000	103,000	66,612
1960-61	171,800	160,000	157,800	89,282

Investment and Labour.—A total investment of about Rs. 6 crores is now estimated to have been incurred in the ferro-manganese industry during the period of the Second Plan as against Rs. 9·5 crores anticipated at the time of formulating the programmes of development in 1956. It is also estimated that this industry employs about 11,000 persons.

Imports and Exports.—The foreign trade in ferro-manganese between 1957 and 1960 was as given below:

(tons)

	Imports			Exports
	Below 3 per cent carbon	Above 3 per cent carbon	Total	
1957	127	148	275	3,001
1958	184	16	200	10,553
1959	147	3	150	8,114
1960	238	..	238	42,471

It may be mentioned that 85% of the above exports were to the U.S.A. while the balance were to U. K., Canada, Greece and Belgium. Most of the steel producing countries manufacture their requirements of ferro-manganese by importing raw ore. The U. S. A. which is the largest consumer produces only about 85% of its ferro-manganese requirements. The balance of about 120,000 tons per annum is met out of imports from countries like West Germany, France, Norway and Japan. Therefore, the Second Plan visualised that if the quality and price are satisfactory there would be good prospects of export trade in this commodity. But in the early years of the Second Plan the actual exports were far below the expectations—the chief reason being that the U. S. A., the largest importer tightened the specifications for ferro-manganese by reducing the phosphorus content to 0·25%. Besides this low phosphorus content the specifications are strict with regard to manganese content which is 70 to 74%. Prior to the change in the specification, the U. S. A. was accepting ferro-manganese containing up to 0·3% phosphorus.

The exports of ferro-manganese were given a fillip in the later years of the Second Plan as a result of the Wheat Barter arrangements negotiated with the U. S. A. by the State Trading Corporation.

The scope for a big step-up in the exports of ferro-manganese can be expected to arise only as and when the various problems facing this industry, which are discussed below, are overcome.

Problems of the Ferro-Manganese Industry.—The production of ferro-manganese, standard grade, presents certain problems as the raw materials differ widely from those of other producing countries. In view of the fact that the U.S.A., which is the main market for Indian ferro-mangenese, had tightened the specifications for this commodity by reducing the phosphorus content to 0·25%, it becomes imperative that the ferro-manganese plants should use only high grade (46% to 48% Mn.) manganese ore with low phosphorus content. Therefore, it is important to see that the ferro-manganese plants are assured of adequate supplies of high grade manganese ore for enabling them to produce a product of marketable grade.

As already mentioned earlier it is very essential to keep down the cost of production to enable the Indian ferro-manganese to be competitive in the international market. In considering this question it has to be noted that although the new ferro-manganese plants are located near the sources of bulk power supply, a few of them are not altogether favourably situated in respect of proximity to high grade manganese ores. Most of the plants are getting their supplies of high grade manganese ore from Madhya Pradesh for blending with the low grade ores available around the plants if not operating on them exclusively. This involves haulage of ore over long distance which raises the cost of production due to addition of freight charges.

In the past some of the entrepreneurs complained that they were not getting adequate supplies of right quality coke for the ferro-manganese production. This was because, although the low phosphorus hard coke required by the ferro-manganese industry was being produced at the Giridih Coke Ovens, the output was small in relation to divergent requirements. There was also an overall shortage of by-product metallurgical coke in the country leading to considerable pressure on the limited supplies even from the less essential consumers. It has been estimated that the total requirements of coke for the ferro-manganese industry in 1960-61 were of the order of 90,000 tons and that they would go up to 150,000 tons during the Third Plan Period when all the schemes under implementation are completed. Since it is every essential to produce high quality ferro-manganese for maintaining and expanding exports, due consideration has to be given to the supplies of the proper grade of coke on which the quality of ferro-manganese depends.

The Coal Controller has been alerted about the shortage of quality coke supplies to the ferro-manganese industry and necessary steps are being taken to make provision for the manufacture of quality coke at the Durgapur Coke Ovens of the West Bengal Government.

Special quality ferro-manganese, although in small quantities, had been imported during the last five years. Therefore, endeavour should be made to take up the manufacture of low carbon ferro-manganese in the country

as otherwise the alloy and tool steel industry will have to depend on imports of this ferro-alloy too.

II. Programmes of Development for the Third Plan:

Estimated Requirements.—The demand for ferro-manganese arises mainly from the requirements of the steel industry in the country and for exports. Assuming the consumption requirements at 10,000 tons of ferro-manganese for each million tons of steel ingots produced and taking into account the phasing of steel production currently envisaged for the Third Plan period, the domestic demand for ferro-manganese would be as under:

	Estimated Production of steel ingots (million tons)	Estimated requirements of ferro-manganese ('000 tons)
1961-62	5·25	58
1962-63	6·25	63
1963-64	7·25	73
1964-65	7·75	78
1965-66	8·50	85

To the above figure of 85,000 tons it will be necessary to add the requirements of foundries and other miscellaneous consumers of ferro-manganese, the demand of which might roughly be placed at 15,000 tons. Thus, the internal requirements of ferro-manganese in 1965-66 are expected to be of the order of 100,000 tons. On balance of all considerations, it is felt that the requirements on account of exports should be reckoned at about the same tonnage. The achievements of this export target of ferro-manganese is of crucial importance and ways and means will have to be explored to ensure its fulfilment. One of the suggestions accepted so far is that the higher grade of ferro-manganese produced in the country should be reserved for exports and the lower grades be utilised by the indigenous steel producers.

Schemes under Implementation.—The following three schemes approved in the later years of the Second Plan period were in varying stages of implementation by 1st April, 1961 and when completed, the total installed capacity for ferro-manganese industry will reach a figure of 262,200 tons:

Project	Location	Annual Capacity (tons)	Remarks
M/s Electro-Metallurgical Works (Expansion).	Dandeli	44,400	Expected to be completed by 1962-63.
M/s Sandur Manganese & Iron Ores (P) Ltd..	Hospet .	30,000 to 36,000	Expected to be completed in 1963-64.
M/s B. P. Khemka (P) Ltd. . . .	Kanhan.	24,000	The plant is expected to be completed during the Third Plan period.
	TOTAL .	98,400 to 104,400	

Capacity Target.—In relation to the total requirements of ferro-manganese as estimated, the capacity that would be installed on completion of the schemes outlined above will be adequate for ensuring domestic production of the same order *viz.*, 200,000 tons by 1965-66. This gives no scope for further expansion of capacity under the Third Plan. If and when additional capacity has to be brought into existence in this field, the question of optimum size of units should be carefully studied before newcomers are allowed to put up plants.

Supplies of Manganese Ore.—During First and Second Plan periods, Geological Survey of India carried out detailed mapping of the famous Chindwara-Balaghat-Bhandara-Nagpur belt of Madhya Pradesh and Maharashtra; Singhbhum-Keonjhar Bonai belt of Bihar and Orissa; Jabua deposits of Madhya Pradesh; Panch Mahal deposits of Gujarat; Banswara-Udaipur deposits of Rajasthan and Visakhapatnam-Srikakulam belt of Andhra Pradesh. The probable reserves of manganese ore excluding the manganiferous rocks of India are estimated at 180 million tons, out of which 48 million tons are of high grade with manganese content over 45 per cent. The country has considerable reserves of low grade manganese ore and the industry has to resort to the exploitation and utilisation of these low grade ores in the long run by beneficiating them.

Further exploration has been planned by the Geological Survey of India during the Third Plan in selected areas in Panch Mahals, Gujarat; Madhya Pradesh belt; Koraput-Kalahandi and Sundergarh belt, Orissa; Banswara-Udaipur belt of Rajasthan; and Chitaldrug, Tumkur, Bellary and Sandur deposits of Mysore.

Investment and Foreign Exchange.—For achieving a capacity of 262,200 tons by 1965-66 by the electro-thermal process through the implementation of the schemes already licensed, plant and machinery worth about Rs. 2 crores would have to be imported. The overall investment requirements are placed at Rs. 2·5 crores during the Third Plan period. Since all the plants already in operation have been established during 1956-61, no investment on replacements are presumed to be required during the Third Plan period.

The maintenance expenditure of foreign exchange for this industry would relate to spares and electrode paste. The requirements of electrode paste are assessed at 0·03 ton per ton of ferro-manganese.

Demand for Electric Power—The requirements of electric power for ferro-manganese production based on the electro-thermal process, are estimated at 800 KW per 1000 tons of output. On this basis, the overall requirements of power would amount to 100,000 KW by 1965-66. The State-wise distribution of this demand on the basis of the units so far licensed would be as under:

State	Electric Power K.W.
Andhra Pradesh	14,250
Bombay	65,000
Mysore	750
Orissa	20,000
TOTAL	100,000

Raw Materials.—The principal raw materials of this industry are manganese ore, coke and limestone. The specifications for the ferro-manganese grade of coke are as follows:

Fixed carbon in the coke not less than 77%
Iron not more than 1%
Silica not more than 20%
Phosphorus not exceeding 0·3 per cent.

For achieving a production target of 200,000 tons of ferro-manganese, the industry will require 400,000 tons of manganese ore in terms of the high grade material, about 150,000 tons of coke and 100,000 tons of limestone.

By-product Industries linked with Ferro-manganese Production.—The production of ferro-manganese in closed electric furnace will give rise to the bye-product gases rich in carbon monoxide. By developing industrial outlets for this gas, the overall cost of ferro-manganese can be brought down to some extent. Though attention to the exploitation of such possibility was recommended under the Second Five Year Plan, there has been little progress so far. It is more probable that these gases might be used for thermal beneficiation of the manganese ores in the Third Plan period.

B. Ferro-Silicon

I. Review of Progress under the Second Five Year Plan:

From the point of view of tonnage consumption, ferro-silicon ranks next in importance to ferro-manganese among major ferro-alloys. Its function is mainly is a deoxidiser and the vehicle for the supply of the alloying element in the production of the electrical grade silicon steels. The Mysore Iron and Steel Works is the pioneer in its manufacture in the country and M/s. Tata Iron and Steel Works, the largest single consumer. Three Tariff Protection enquiries were held in the post-second World War period into the claims of the industry for protection, in 1947, 1949 and 1953. The manufacture of ferro-silicon made considerable progress under the benefit of protective duties imposed between 1947 and 1953. In its 1953 enquiry, the Tariff Commission came to the conclusion that protection was no longer needed for meeting foreign competition on the basis of the estimated fair selling price of the indigenous product as compared to the landed cost of imported ferro-silicon. The production of ferro-silicon has more than doubled during the last decade as the following data would show:

	Domestic Production of Ferro-silicon [(tons)
1950	2,741
1951	2,793
1952	4,063
1953	3,808
1954	4,417
1955	5,184
1956	4,523
1957	4,621
1958	5,675
1959	7,203
1960	7,009

The requirements of ferro-silicon were estimated at 4,500 tons per annum by the end of the First Plan. Consequent on the expansion of the production of steel ingots to six million tons visualised under the Second Plan and taking into account other demands from the foundry industry and in respect of electrical steel ingots manufactured by the re-rollers, it was visualised that the demand would go up to about 20,000 tons by 1960-61. In order to arrange for additional production within the country, the following schemes were approved for implementation :—

(i) expansion of manufacture of ferro-silicon at Bhadravati from the current installed capacity of 5,000 to 20,000 tons by the Mysore Iron and Steel Works (Public Sector project).

(ii) manufacture of 5,000 tons of ferro-silicon per year under the composite scheme of M/s. Serajuddin and Co., envisaging production of ferro-chrome and ferro-silicon in the first stage of implementation and at a suitable location in the Bhadrak district of Orissa.

Import licences for the machinery of these two schemes have been issued and the additional capacity is expected to be in position in the second year of the Third Plan, if not earlier. An annual installed capacity of 25,000 tons of ferro-silicon would thus be available from the second year of the Third Plan.

The output of ferro-silicon from the Mysore Iron and Steel Works comprises material of the following grades :

Silicon content : 75 to 80% ; 70 to 75% ; 60 to 70% and 45 to 50%.

As a solution for the difficulties connected with the marketing of the low grade materials, the Tariff Commission recommended in January, 1961 differential fair selling prices, from 1st April 1960 f.o.r. Bhadravati ranging from Rs. 1,040 per ton for 75-80% grade to Rs. 643 per ton of 45-50% grade. The quality of indigenous ferro-silicon was found to be generally satisfactory.

The requirements of raw materials and power per ton of 70-75% grade ferro-silicon produced by the Mysore Iron and Steel Works in 1952-53 have been estimated by the Tariff Commission as under :—

Quartz	1·782 tons.
Iron scrap	0·410 tons.
Charcoal	1·217 tons
Electricity	9,904 kwh
Electrode paste	205·1 pounds.

II. Programme of Development under the Third Plan :

Estimated Requirements.—The projection of requirements for the Third Plan will have to take due note of the expansion programmes for steel, alloy and tool steels, and stainless steel, electrical grade silicon steel, steel castings and electric furnance billets based on scrap. It is roughly estimated that for a production of 10 million tons of ingots, the requirements of ferro-silicon

under the steel industry alone will be of the order of 25,000 tons. The requirements of the Alloy and Tools Steel Plants that might be set up in the Third Plan and of the steel castings industry are not definitely known at present. The target for alloy and tool steels including stainless steel is 200,000 tons. The overall demand by 1965-66 for ferro-silicon is not expected to exceed 40,000 tons.

Target.—It is felt that by planning for a capacity of 40,000 tons of ferro-silicon the consumption requirement of the last year of the Third Plan would be adequately met.

Schemes under implementation.—As already mentioned earlier, two firms namely the Mysore Iron and Steel Works and M/s. Serajuddin & Co., have been granted licences, the former to expand its capacity to 20,000 tons and the latter to establish a new plant with a capacity of 5,000 tons of ferro-silicon per annum. In addition to the above, the scheme of Shri B. D. Panda for establishing a plant with a capacity of 7,200 tons per annum has been approved by the Government. Foreign exchange towards the machinery requirements of these schemes has been cleared and the additional capacity is expected to be in possession in the latter half of the Third Plan period. An annual installed capacity of 32,000 tons of ferro-silicon would thus be available during the Third Plan period. Thus there is scope for setting up an additional capacity of about 8,000 tons per annum for the manufacture of ferro-silicon.

Investment and Foreign Exchange.—It has been estimated that the Mysore Iron and Steel Works would have incurred an expenditure of Rs. 0·35 crores during the Second Plan period and the balance of Rs. 0·95 crores is expected to be spent during the Third Plan on their ferro-silicon plant. The schemes that are to be implemented during the Third Plan period are estimated to entail an investment of about Rs. 2·0 crores half of which may be in the shape of foreign exchange.

C. Ferro-Chrome

There has been no regular production of ferro-chrome in the country so far on account of the absence of an appreciable internal demand. The current demand in the country, as reflected from the import data is estimated at about 200 to 250 tons. The following two schemes for the manufacture of ferro-chrome have been licensed in the Second Plan period but no capacity has so far been established:

Name	Location	Capacity per annum (tons)
M/s Ferro-Alloys Corporation, Tumsar . . .	Tumsar (Bombay)	6,000
M/s Serajuddin & Co., Calcutta	Bhadrak (Orissa)	10,000

On the basis of the target of 200,000 tons per annum set for tools, alloy and special steels by the end of the Third Plan period it is estimated that the demand for ferro-chrome will be of the order of 20,000 tons. It is suggested that the progress of the existing schemes should be reviewed and capacity for ferro-chrome fostered in step with the growing requirements for this ferro-alloy. In this context a capacity target of 20,000 tons is recommended. This is an item of some export potential also.

The composition of the ferro-chrome required in the alloy steels industry is as follows :—

	High Carbon	Low Carbon
Chromium	65-70 per cent	65 to 70 per cent.
Carbon	6—8 per cent	0·1 Max.
Silicon	0·03 Max.	1·5 Max.
Sulphur	0·05 Max.	0·05 Max.
Phosphorus	0·05 Max.	0·05 Max.

Raw materials.—Although at present some restriction has been placed on the export of high grade chrome ore, in coming years, it will undoubtedly become necessary to reserve all high grade ore for internal consumption by the ferro-chrome plants when they are established and to refractory industries. Geological Survey of India has carried out detailed mapping of the Nausahi and Maruabil deposits of Orissa; Ratnagiri deposits of Maharashtra and the Nuggihalli schist belt and Shinduvalli deposits of Mysore. Chromite ore of ferro-chrome grade is restricted to deposits in Orissa and Mysore. The probable reserves of ferro-chrome grade in these two states is of the order of 3 million tons. Further studies of Mysore and Orissa deposits are planned during the Third Plan period.

D. Other Ferro-Alloys

The other ferro-alloys of importance are ferro-titanium, ferro-tungsten, ferro-vanadium. The quantum of offtake for each of these would be linked with the production targets for the manufacture of different categories of alloy and tool steels. *Prima facie*, the development of indigenous capacity should be welcome if the levels of demand for the different items, separately or taken together, provide the conditions for the establishment of production facilities on a viable basis. Geological Survey of India carried out a preliminary assessment of Vanadiferous magnetite deposits of Bihar, Orissa and Mysore and the reserves are estimated at 26 million tons. The only factory located at Rairangpur which utilised vanadiferous mangnetite deposits for the production of ferro vanadium is closed at present. The Rajasthan tungsten deposits are being explored by Indian Bureau of Mines.

4. ALUMINIUM

1. Review of Progress in the Second Plan:

Target.—The Second Plan envisaged the expansion of the capacity for aluminium ingots from 7,500 tons in 1955-56 to 30,000 tons by 1960-61 through (1) the expansion of the existing plant of M/s. Aluminium Corporation of India located at Asansol to 5,000 tons; (2) the establishment by M/s. Indian Aluminium Company (IAC) of a new 10,000 tons smelter near Hirakud; and (3) the establishment of a new smelter with a capacity of 10,000 tons at Salem through the National Industrial Development Corporation (NIDC). It was expected that capacity for the production of the alumina required by the Hirakud smelter corresponding to about 20,000 tons would be built up within three years of its commencement of production and that the company would be allowed to import alumina during the interval.

A target of 25,000 tons was fixed for the actual production of aluminium in 1960-61.

Capacity and Production.—As envisaged earlier the Hirakud smelter of the IAC went into production in January, 1959. Even though the expansion programme of M/s. Aluminium Corporation of India was scheduled to be completed by the end of 1959 it could not be implemented during the Second Plan Period due to various difficulties. The smelter envisaged at Salem did not materialise as a NIDC scheme due to the fact that the total resources allocated for NIDC were considerably short of the requirements for the various projects under its consideration. The foreign exchange crisis was also a factor which led to a re-orientation of thinking and ultimately approving alternative arrangements for the development of this project by private enterprise. With the large scale demands generated for A.C.S.R. conductors as a result of the step-up in the power development programmes the prospects for the establishment of viable aluminum plants became brighter, and much interest was shown by private entrepreneurs since 1958. In the circumstance, the proposals for establishing new capacity for aluminium in collaboration with foreign private enterprise were encouraged by the Government. Though considerable preparatory work was carried out on new aluminium schemes, due to the reasons explained above the total installed capacity for aluminium ingots reached only 18,100 tons by 1960-61 as indicated below:

Name of Producer	Installed capacity (in tons)
M/s. Indian Aluminium Co. Ltd.	
(*a*) Alupuram	5,600
(*b*) Hirakud	10,000
M/s. Aluminium Corporation of India	2,500
TOTAL	18,100

Actual production of aluminium by M/s. Indian Aluminium Company and M/s. Aluminium Corporation of India since the commencement of the Second Plan was as shown below:

Production Statistics of M/s. Indian Aluminium Co. and M/s. Aluminium Corporation of India

(tons)

	Indian Aluminium Co.		Aluminium Corporation of India		Total	
	Ingots	Sheets & Circles	Ingots	Sheets & Circles	Ingots	Sheets & Circles
1	2	3	4	5	6	7
1956 . .	4,884·00	5,977·00	2,340·95	1,764·35	7,224·95	7,741·35
1957 . .	5,521·00	7,285·00	2,262·00	1,786·44	7,783·00	9,071·44
1958 . .	5,712·00	8,745·00	2,469·24	1,680·41	8,181·24	10,425·41
1959 . .	14,762·00	10,254·00	2,485·53	2,135·46	17,247·53	12,389·46
1960 . .	15,890·00	10,286·00	2,353·00	2,059·55	18,243·00	12,345·55

Imports.—Since 1st January, 1957 imports of aluminium and other products are recorded in greater detail in the 'Monthly Statistics of Foreign Trade of India'. The actual imports during the period of the Second Plan were as under:

(tons)

Name of the article	1957	1958	1959	1960	Remarks
1	2	3	4	5	6
(A) Aluminium and Aluminium Alloys Unwrought—					
(1) Aluminium Base Alloy .	8·55	65·50	62·65	6·74	
(2) Aluminium Ingots . .	5,710·40	6,824·75	6,577·05	7,850·25	
Others	37·60	224·50	166·25	110·85	
TOTAL .	5,756·55	7,114·75	6,805·95	7,967·84	
Aluminium and Aluminium Alloys—Worked Bars, Rods, Plates, Sheets, Wires, Pipes, Tubes, Castings and Forgings—					
(1) Bare Aluminium Wire Solid Hard Drawn.	22·75	2·35	1,002·35	3,653·05	

1	2	3	4	5	6
(2) Bars and Rods . .	11,615·50	9,269·80	7,187·00	6,935·64	
(3) Circles . . .	1·25	Nil	159·85	209·85	
(4) Foil Aluminium for Teachest Lining*	*20·05	771·60	1,599·90	2,225·71	*These figures obviously include imports of foil stock, although the same have not been shown in the monthly Statistics of Foreign Trade of India.
(5) Foil and Leaf excluding Teachest Lining	627·25	76·90	24·60	51·30	
(6) Pipes and Tubes . .	140·25	31·55	28·15	198·03	
(7) Powder . . .	131·95	69·85	171·35	86·88	
(8) Sheets, Plates and Strips	1,849·00	1,101·25	608·90	887·45	
(9) Wire N.E.S. .	553·00	99·75	8·50	198·15	
(10) Others . . .	673·50	624·85	1,364·15	680·85	
TOTAL .	15,634·50	12,047·90	12,204·75	15,126·91	
GRAND TOTAL (A & B) .	21,391·05	19,162·65	19,010·70	23,094·75	

Consumption.—It was expected that the demand for aluminium would expand from 20,000 tons to nearly 30,000 tons by 1960-61 mainly owing to an increase in the production of A.C.S.R. cables. Even while indicating the above estimate, reference was made to the probability that the demand arising out of the A.C.S.R. conductors might go much higher than the figure of 13,000 tons indicated for it. It has also been mentioned that keeping in view the modern trends the demand for aluminium might also develop in new line *e.g.*, the construction of bridges, aluminium structurals, bodies for buses and rail coaches, and in the field of air-craft manufacture. In view of this it was indicated that the target of 30,000 tons of aluminium represented the minimum requirements by 1960-61. The present total requirements of aluminium have been estimated at 45,000 tons by the Tariff Commission in their Report (1960) on Aluminium Industry, the break-up of which is given below:

Consuming Industry	1960 (tons)
Utensils	11,000
A.C.S.R. and A.A.C.	16,000
Transportation and aluminium alloys	7,000
Building and construction	3,000
Food and farming	1,000
Canning and packaging	3,000
Miscellaneous	4,000
TOTAL .	45,000

The unexpected increase in demand is attributed to the versatile properties of the metal—the combination of lightness and strength, high thermal and electric conductivity, corrosion resistance and easy workability. In view of

the following factors the Tariff Commission were of the opinion that the demand for aluminium will rise considerably during the next few years.

1. Aluminium sheet metal is competitive with galvanised iron and steel.
2. Aluminium utensils serve the same uses as the stainless steel, common steel, copper, brass and enamel ware.
3. Aluminium foil shares markets with lead, tin, paper and plastics.
4. Aluminium electrical conductors are competitive with copper conductors.
5. The price of aluminium remained more or less steady for a number of years as compared to that of non-ferrous metals.

Investment and Labour.—A total investment of about Rs. 12 crores is now estimated to have been incurred in the aluminium industry during the Second Plan period as against Rs. 22·0 crores anticipated at the time of formulating the programmes of development in 1956. The shortfall in investment is due to the fact that the establishment of a smelter at Salem did not materialise and also the delay in the implementation of the expansion programme of M/s. Aluminium Corporation of India. It is estimated that this industry employs about 8,000 persons.

Action on Recommendations.—The Plan recommended that the new petroleum refineries projected in the public sector should include in their manufacturing programme the production of calcined petroleum coke required by the aluminium industry. Accordingly, while deciding the product pattern to be adopted for the public sector refineries programmed at Nunmati and Barauni, care has been taken to include facilities for the production of petroleum coke at these refineries. It is envisaged that these refineries will produce about 111,000 tons of green petroleum coke which when processed would give about 82,000 tons of calcined petroleum coke. When these facilities are established in the country, the aluminium industry will have an assured supply of petroleum coke from indigenous sources.

Tariff Protection.—In accordance with the recommendations made by the Tariff Commission in their Report (1958) on the continuance of protection to the Aluminium industry Government granted extension of protection from January 1959 to December, 31, 1960 at the existing levels of duty namely 30% *ad valorem* plus surcharge of 5% of the total duty. The Tariff Commission, which have gone into the question of the continuance of protection to the aluminium industry recommended in 1960 that the protection granted to aluminium ingots, bars and other aluminium manufactures should be continued for a further period of four years upto December 31, 1964, but the rate of protective duty should be reduced to 25% *ad valorem*. The Government while accepting the recommendation with regard to the continuance of protection to the industry up to December 31, 1964, expressed the view that the question of reduction in the rate of protective duty required further examination.

In accordance with the recommendation made by the Tariff Commission, the Government granted extension of the existing concessioal rates of

duty of 20% *ad valorem*, standard, and 10% *ad valorem* preferential, on imports of alumina by the aluminium manufacturers up to December 31, 1964.

By the Finance Act, 1960, excise duties at Rs. 300 per metric ton of aluminium in any crude form including ingots, bars, blocks, slabs, billets, shorts and pellets and Rs. 500 per metric ton of aluminium manufactures namely, plates, sheets, circles, strips and foil in any form or size were imposed from 1st March, 1960. To remove the disadvantage of excise duty to the domestic industry, countervailing duties at the above rates of excise were fixed in respect of imports of the corresponding products.

Raw Materials.—Although it is known that India possesses bauxite, the basic raw material for aluminium, to the extent of 250 million tons, accurate detailed information regarding the extent and quality of the individual deposits has not yet been collected; only reserves of 25 million tons have stated to have been proved to be suitable for the manufacture of aluminium. Therefore, it is very essential to carry out detailed investigations of all the more promising bauxite deposits in the country in order to plan for the development of the aluminium industry on a longer term basis as well as in the context of further expansion of aluminium production if contemplated under the Third Plan. The situation of bauxite deposits will also have a bearing on the locational aspects.

In view of the increasing demand for electrical grade aluminium it is important that producers should maximise the production of electrical grade aluminium.

II. Programme of Development in the Third Plan:

Estimated Requirements.—The large investment envisaged in the Third Plan in the Public Sector and its emphasis on engineering and heavy industry, power and transport is calculated to raise substantially the demand for aluminium, also because it is necessary to encourage its use for certain purposes in place of other metals like copper of which supplies within the country are not plentiful. The Tariff Commission Report on the Aluminium Industry (1960) placed the requirements by 1963 at 74,000 tons per annum as given below:

	(tons)
Utensils	16,000*
A.C.S.R. and A.A.C.	27,000
Transportation and aluminium alloys	11,500
Building and construction	5,000
Food and farming	2,500
Canning and packaging	6,000
Miscellaneous	6,000
TOTAL	74,000

*The estimate excludes those which are fabricated out of scrap.

A recent estimate, made after a clearer picture of the developments under the Third Plan has emerged, by a Committee set up by the Ministry of Commerce and Industry has placed the total requirements by 1965-66 at 115,000 tons, the break up of which is given below:

	(tons)	
Electrical grade		
Transmission and distribution lines	40,000	
Bus bars and die-castings	6,000	
Substitution in power cables and house wiring	5,000	
Miscellaneous	4,000	
		55,000
Commercial grade		
Domestic utensils	25,000	
Transportation and aluminium alloys	12,000	
Packing (foils)	7,500	
Building construction	4,000	
Food, Farming, Sugar industries etc.	4,000	
Miscellaneous, including the requirements of steel industries and normal exports.	8,000	
		60,500
TOTAL		115,500

On the assumption that the secondary aluminium metal is expected to be available to the extent of 10,000 tons, the Committee estimated the requirements of the primary metal at 105,500 tons by 1965-66 and recommended that in order to meet the internal requirements of electrolytic grade aluminium in full, it may be necessary to plan on the basis of an offtake of 110,000 tons per year by 1965-66.

Major assumptions underlying the Committee's demand estimates are :—

1. A realistic provision has been made for substitution of copper by aluminium in electrical industries during the Third Five Year Plan.
2. In the field of domestic utensils and similar requirements the provision for substitution of copper/brass by aluminium is only marginal.
3. The overall demand estimates include only a nominal provision for export at the present level of about 1,000 tons per year; and all other exports of aluminium metal, whether for the purpose of paying for the cost of imported plant and equipment for the setting up of new units for production of aluminium or for direct earning of foreign exchange by export of aluminium ingots or fabrications, will require additional capacity for aluminium.

Schemes under implementation.—The following additional capacity has been licensed and the schemes approved by Government are in varying stages of implementation :

	(tons)
M/s. Indian Aluminium Company:	
(*a*) Expansion of the smelter at Hirakud	10,000
(*b*) Expansion of the smelter at Alwaye	5,000
M/s. Aluminium Corporation of India:	
(*a*) Expansion of their existing unit at Asansol	5,000
New Unit of M/s. Hindustan Aluminium Corporation at Rihand	19,682
New Unit of M/s. Tendulkar Industries at Koyna	19,682
New Unit of M/s Madras Aluminium at Mettur	9,841
TOTAL	69,205

M/s. Indian Aluminium Company had made satisfactory progress with their expansion programme of the smelter at Hirakud. It is expected that, barring unforeseen difficulties, the additional capacity would be commissioned by the end of 1961. The expanded facilities for the production of alumina at Muri and the connected development of mining capacity of bauxite are likely to be ready by the end of 1961. The second extrusion press at Alupuram is likely to be ready by the end of 1961. The necessary rolling capacity will also be established at Belur by the end of 1961.

The expansion scheme of the smelter at Alwaye has been cleared under the Industries (Development and Regulation) Act, 1951, but has not so far been finally cleared with regard to foreign exchange and collaboration.

M/s. Aluminium Corporation of India have undertaken the expansion programme for trebling the production of their existing plant at Asansol. The Corporation adopted the latest trends in the designs in their plant after examining the most modern plants in different parts of the world and in consultation with thir technical collaborators M/s. Aluminium-Industries-Aktien-Gesellschaft, Zurich, Switzerland. According to the present indications the first production from the expansion programme is expected to start by the end of 1961.

M/s. Hindustan Aluminium Corporation have made sufficient progress on their scheme for the establishment of an integrated aluminium plant at Rihand in Uttar Pradesh in collaboration with Kaiser Engineers of U.S.A. The aluminia plant is expected to be ready for operation by April, 1962 while the aluminium reduction plant will be ready by February, 1962.

M/s. Tendulkar Industries have been granted licence for the establishment of an aluminium smelter based on power from Koyna. It is not likely that this plant will go into operation before the end of 1965.

The scheme of M/s. Madras Aluminium has already been cleared finally for both for foreign exchange and collaboration with Montecatini of Italy. It is expected that the smelter would be established by the end of 1963.

Additional Capacity.—When all the above schemes are implemented a total capacity of 87,305 tons for aluminium would have been established. Of the total output it is expected, on the basis of planning as approved so far, that the production of electrolytic grade aluminium will be only about 28,000 tons, whereas, as already mentioned earlier, the demand for electrical grade aluminium by 1965-66 is visualised at 55,000 tons per annum. Therefore, there is from the demand angle some justification for considering additional capacity for aluminium even in relation to the Third Plan. Additional capacity in this field might also have to be viewed as advance planning in relation to the Fourth Plan for which a target of 230,000 to 250,000 tons has been envisaged. New processes for aluminium production are reported to be under investigation in recent years. A new process—the first major technological change in the method of manufacturing aluminium—is to be put into semi-commercial operation in Canada. If successful, it will not appreciably reduce the large power requirements of the existing process, or its dependence upon bauxite, but it gives promise of considerable savings in other elements of production cost, and particularly of substantial reduction in capital costs. The new experimental plant is expected to be completed early in 1962, with a production capacity of six to eight thousand tons of aluminium per year. It is stated that operation on this scale for a couple of years or so will be required to determine whether the estimated savings in capital and operating cost can be realised in large-scale operations.

Growth of Demand and Supply of Aluminium.—The data in the following table give an indication of the growth of demand and likely indigenous supplies of aluminium during the Third Plan period.

('000 tons)

	Demand			Production			Imports		
	Electrical grade	Commercial grade	Total	Electrical grade	Commercial grade	Total	Electrical grade	Commercial grade	Total
1961-62 . . .	23·0	35·0	58·0	2·5	15·5	18·0	20·5	19·5	40·0
1962-63 . . .	27·0	40·0	67·0	11·0	28·0	39·0	16·0	12·0	28·0
1963-64 . . .	33·0	44·0	77·0	15·0	37·0	52·0	18·0	7·0	25·0
1964-65 . . .	45·0	51·0	96·0	20·0	41·5	61·5	25·0	9·5	34·5
1965-66 . . .	55·0	60·0	115·0	28·0	52·0	80·0	27·0	8·0	35·0

The estimated imports will go down considerably if additional capacity is approved for implementation and production materialises from such capacity in the last two years of the Third Plan.

Investment and Employment.—The overall investment of the development programme of the aluminium industry under the Third plan is estimated at about Rs. 65·0 crores. About 8,000 to 10,0000 additional persons are expected to find employment in this industry.

Requirements of Raw Materials and Power.—To achieve the production target of 80,000 tons, the industry will require about 375,000 tons of bauxite, 16,000 tons of caustic soda, 8,000 tons of cryolite; 58,000 tons of petroleum coke and 200,000 K.W. of power.

The following table summarises the development programme of the industry envisaged in the Third Plan.

	Unit	1960-61	1965-66
Number of smelters		3	6
Installed Capacity	tons	18,100	87 305
Production	tons	18,243*	80,000

*Production during 1960.

5. NON-FERROUS METALS—COPPER, LEAD & ZINC

Copper, lead and zinc are the most important non-ferrous metals which, apart from aluminium (already discussed) and tin form a major group of industrial raw materials of the Indian economy. Their indigenous production is negligible as compared to the requirements which have expanded at a fast rate, particularly in the last ten years, in the context of the successive five year Plans. The recent discovery of some promising deposits of non-ferrous metallic ores *e.g.* lead-zinc ores of Zawar, Khetri and Daribo copper deposits is a turning point in the history of India's efforts at promoting a broad-based non-ferrous metals industry in the country. The existing situation in regard to copper, lead and zinc and the development programmes for indigenous production of these metals under the Third Plan are outlined below :

A. Copper

1. Review and Present Status of the Industry :

Though there are numerous occurrences of copper in the country and many of them were centres of mining activity in the past, extraction of copper ores is at present confined to only one area *viz.* Mosabani area in the Singhbhum District, Bihar, which is worked by M/s. Indian Copper Corporation. Attention was first drawn in 1829 to the existence of old workings and a description of old workings in Kharsawan was given in 1854. The first company to work the copper occurrences in the copper belt stretching over a distance of 80 miles in the Singhbhum District was formed in 1857 and between then and 1924 a number of companies were formed one after the other, but all of them went into liquidation. M/s. Cordoba Copper Company managed by M/s. John Taylor & Sons prospected the Mosabani area between 1920 and 1924—and this led to the establishment in 1924 of M/s. Indian Copper Corporation which stated working the large reserves proved by M/s. Cordoba Copper Company.

During the first two Plan periods, there has not been any appreciable development on the extraction side of the base metals industry in India due to paucity of commercially exploitable ore deposits. Although the Geological Survey of India (GSI) and the Indian Bureau of Mines (IBM) could not carry on energetically the investigation of the known deposits of ores of copper, lead and zinc during the First Plan period, a new unit "Base Metals Wing" was set up in early 1959 in the GSI with a view to expediting the detailed survey of all the known deposits and to continuing more vigorous search for the location of new deposits of the non-ferrous metals.

Detailed work in the Khetri-Daribo area of Rajasthan and Rangpo area of Sikkim has established substantial workable reserves of copper ore—about 28 million tons with an average copper content of 0.8% metal in Khetri and about 0.35 million tons averaging about 6.24% of combined

copper, lead and zinc in Rangpo. The deposits in Daribo are reported to be richer in copper content but the extent of the reserves is yet to be fully proved.

M/s. Indian Copper Corporation have been working their mines for a long time and are the only producer of copper in India at present. The production of copper ranged between 7,500 and 8,950 tons during the Second Plan period as indicated below:

(in tons)

	Copper ore	Copper concentrates	Copper metal
1956	386,196	31,770	7,628
1957	403,929	31,857	7,848
1958	404,941	32,941	7,839
1959	397,587	35,709	7,642
1960	440,888	36,460	8,933

Domestic production meets only a small part of the country's requirements of this metal. The total availability *i.e.* indigenous production plus imports during 1960 was of the order of 70,000 tons. The demand for this metal is estimated at a much higher level. Further, the present production is wholly of the fire-refined variety whereas the bulk of the demand is for the electrolytic grade. Therefore, large tonnages of copper, copper alloys and other manufactures had to be imported during the Second Plan period as under :—

	Quantity ('000 tons)	Value (Rs. crores)
1956	31·28	15·16
1957	47·86	17·03
1958	51·51	13·43
1959	50·35	16·31
1960	62·24	21·65

Investment and Employment—M/s. Indian Copper Corporation have invested about Rs. 5.60 crores on the developmental activity such as proving of reserves of copper ore and on the plant and machinery during the Second Plan period. The Corporation provide employment to about 800 persons.

II. Programmes of Development for the Third Plan:

Estimated Requirements.—The Development Council for Non-Ferrous Metals had estimated the requirement of copper by 1965-66 at 170,000 tons per year, without taking into consideration the substitution possibilities

by aluminium. Reckoning these possibilities as equivalent to about 20,000 tons of copper, the Council estimated the demand for copper inclusive of the copper element of brass in 1965-66 as follows:

Sl. No.	Name of the industry	Estimated demand 1965-66 (tons)	
1	Commercial copper sheets and circles (hot rolled)	4,000	
	Copper sheet (cold rolled)	1,500	
2	Industrial copper strips (cold rolled) in cut length and coils	2,500	
3	Electrolytic copper wire rods for cables, wires & strips	75,000	
4	Copper rods & sections (extruded)	2,000	
5	Copper pipes & tubes (extruded)	2,500	87,500
6	Commercial brass sheets/circles (hot rolled)	35,000	
	Brass sheets (cold rolled)	4,000	
7	Industrial brass strips in cut lengths or coils (cold rolled)	8,000	
8	Brass rods & section (extruded)	10,000	
9	Brass pipes & tubes (extruded)	6,000	
10	Brass/copper wires (non-electrical)	3,500	
11	Copper base alloys & castings	30,000	96,500
	Copper equivalent		62,700
	TOTAL		150,200

NOTE.—Items 1 to 5 total to 87,500 tons of copper. Items 6 to 11 are for copper and brass base alloys and total to 96,500 tons. Taking an average of 65 per cent of copper content, this will work out to 62,700 tons. Thus the total requirement of copper would come to about 150,000 tons including the substitution.

Schemes under implementation.—On the basis of the reserves proved in Khetri and those indicated in Daribo in Rajasthan, a project has been prepared for the establishment of a smelter in the public sector with a capacity of 11,500 tons of electrolytic copper per annum at Khetri. About 10,000 tons of metal is expected to be produced at this smelter. The Third Plan includes a project with an estimated capital outlay of Rs. 12.5 crores for the mining and concentration of the ore at Khetri and Daribo and smelting the concentrates at a smelter to be established at Khetri. On the present indications this smelter is likely to be established by the middle of 1964.

On the basis of reserves of 0.35 lakh tons of copper, lead and zinc ores proved by the Indian Bureau of Mines in Bhotang Mines, Sikkim with an average of 6.24% of combined metal content, a project has been prepared for producing copper, lead and zinc metals. These deposits are to be exploited by the Sikkim Mining Corporation, a joint venture of the Sikkim Durbar and the Government of India. The ore mined will be concentrated at the mine and will be railed to be smelted at one of the smelters in the country.

M/s. Indian Copper Corporation have been granted licence for the manufacture of 8,400 tons of electrolytic copper per annum from out of imported blister copper. This plant will be located near their existing plant at Ghatsila

which is now manufacturing the fire-refined copper. The investment on this plant is expected to be of the order of Rs. 0·6 crore with a foreign exchange of Rs. 0·4 crore. The design of this refinery is now well advanced and construction is expected to commence during the year 1962. It will be seen from the above programmes that about 20,000 tons of electrolytic copper can be produced by the end of the Third Plan period as indicated below:

	(tons per annum)	
Smelter at Khetri	10,000	
Duribo and Sikkim deposits	2,000	(approximate).
Indian Copper Corporation	8,400	
TOTAL	20,400	

Demand and Supplies.—The demand for copper, the indigenous production and the import requirements are expected to be as indicated below during the Third Plan period.

('000 tons)

	Demand	Domestic production and scrap	Import requirements
1961-62	90	13	77
1962-63	101	14	87
1963-64	115	15	100
1964-65	135	23	112
1965-66	145	35	110

Both the Geological Survey of India and the Indian Bureau of Mines are expected to intensify their exploration programme with a view to locating further workable reserves of non-ferrous metals for enabling the establishment of additional capacity based on the indigenous sources.

B. LEAD

1. Review and Present Status of the Industry:

The most important deposits of lead and zinc ores occur at Zawar which is about 17 miles from Udaipur city where extensive ancient workings are in existence. These deposits were opened by the Geological Survey of India during the Second World War but the work was stopped by the end of the war, as by that time enough development had not been done to warrant mining for production of lead and zinc ores. Soon after the end of the war

the property was handed back to the Government of Mewar, who then gave it on lease to M/s. Metal Corporation of India who did some further development work after taking over the mines.

The present mining capacity is 500 tons run-off mine ore per day. During the year 1960-61, 145,000 tons of ore were beneficiated with average metal content of 3·39 per cent lead and 4·39 per cent zinc. Lead concentrates produced are smelted at the Corporation's lead smelter at Tundoo near Dhanbad. The zinc concentrates produced are sent to Japan for treatment on toll basis and the zinc metal produced is brought back to the country.

The Corporation have undertaken a large expansion programme to raise mining capacity to 2,000 tons per day with the installation of 2,000 tons ore beneficiation plant.

The outlook for the lead industry has considerably improved in the last few years. The current annual production of lead from the only smelter of M/s. Metal Corporation of India at Tundoo, Bihar, is of the order of 4,000 tons against the installed capacity of 6,000 tons *per annum*. The current demand has been estimated by the Development Council for Non-Ferrous Metals as 35,000 tons per year.

The domestic production of lead and the imports of lead and lead alloys during the Second Plan period were as under:

(in tons)

	Lead and zinc ore	Lead concentrates	Zinc concentrates	Lead Metal
1956	79,959	3,909	6,880	2,497
1957	95,452	4,850	7,469	3,175
1958	115,832	5,256	7,258	3,333
1959	159,400	6,385	9,820	3,895
1960	149,991	6,146	9,632	3,671

The imports of lead are given in the table below:

	Quantity in '000 tons	Value in Rs. crores
1956	16·31	2·74
1957	14·53	2·21
1958	21·50	2·29
1959	23·76	2·41
1960	24·61	2·56

II. Programme of Development for the Third Plan:

Estimated Requirements.—As against an availability of about 32,000 tons in 1960-61 (the availability based on indigenous production and imports is considered to be inadequate for meeting the demands in full), the demand for lead is expected to rise to 60,000 to 65,000 tons by 1965-66, with the break-up as given below:

	1965-66 (tons)
Non-ferrous semis and alloys	12,000
Electric Industries	30,000 to 35,000
Chemicals (Paints)	12,500
Heavy Mechanical Engineering and Light Mechanical Engineering.	2,500
Small Scale Industries	2,000
Miscellaneous	1,000
TOTAL	60,000 to 65,000

Schemes under Implementation.—M/s. Metal Corporation of India have been granted a licence for expending the capacity of their smelter at Tundoo to 11,000 metric tons per year. The project is expected to be completed by early 1964.

The demand and indigenous supply position of lead are expected to be as under in the Third Plan Period:

('000 tons)

	Estimates of Demand	Production
1961-62	35	4
1962-63	41	5
1963-64	47	6
1964-65	53	9
1965-66	59	9

The estimates of production given above do not take into account supplies of lead, if any, that might become available as and when the scheme of M/s. Binani for the manufacture of 12,000 metric tons of lead per year from imported concentrates is implemented.

C. Zinc

I. Review and Present Status of the Industry:

In the absence of smelting facilities, the only existing firm, M/s. Metal Corporation of India, have been exporting about 7,000 to 8,000 tons of zinc concentrates annually to Japan for smelting on toll basis. However, a beginning has been made during the Second Plan Period for creating indigenous capacity for the manufacture of electrolytic zinc in the country. M/s. Metal Corporation of India have taken steps with a view to establishing a plant near Udaipur with technical collaboration and financial participation of Krebs & Penarrava CIE of Paris for the manufacture of the following products:—

Zinc	18,000 metric tons per year.
Cadmium (by product recovery) . .	75 tons per year.

The project is based on the utilisation of lead-zinc ores of Zawar Mines, Udaipur, the only promising deposit in the country.

M/s. Metal Corporation of India estimated the ore reserve at Zawar mines as follows:

At Mochia-Mongra hill, proved & probable reserves are between 8 to 9 million tons upto a depth of 1,000 ft. with an average metal content of 7% with lead at about 2·4% and zinc about 4·6%.

At Balaria which is adjacent to the other hill, diamond drilling operation has indicated proved reserves of about 2 million tons up to a depth of 600 ft. on horizon of 800 ft. and probable reserves about double this quantity. Further drilling operations are being carried out.

The ore is a mixture of sphalarite and pyrite and average analysis shows zinc content of 7·5-8% and sulphur content of 19%.

As already mentioned earlier the Corporation have undertaken a large expansion programme to raise mining capacity to 2,000 tons per day and the installation of an electrolytic zinc smelter near Udaipur. The total cost of the scheme including installation of Zinc Smelter and its ancillaries, development of mine and mill and expansion of lead smelter is estimated to be about Rs. 8·5 crores with a foreign exchange element of about Rs. 4·5 crores. The development programme is expected to be completed and operation started by early 1964.

The Development Council for Non-Ferrous Metals have recently estimated that the present requirements of zinc are of the order of 85,000 tons *per annum* and that they are likely to go up to 185,000 tons by 1965-66. It may be possible to bring down the requirements of zinc considerably in the coming years if the new process of coating iron or steel material with a protective layer of aluminium reported to have been developed by the National Metallurgical Laboratory, could be adopted by the galvanising plants in India for coating sheets, wire and tubes.

The actual imports of this metal during the Second Plan period were as under:

	Quantity in '000 tons	Value in Rs. crores
1956	37·80	5·67
1957	53·40	7·24
1958	59·53	6·13
1959	48·04	5·28
1960	67·17	8·81

It will be seen that with the completion of the zinc smelter at Udaipur by M/s. Metal Corporation of India, the installed capacity for this metal will be only 18,000 metric tons *per annum* whereas the demand for the metal has been rising steadily. As the establishment of smelters after proving sufficient reserves takes time, it may be necessary to permit establishment of smelters, as a temporary measure, based on imported concentrates. Recently, the scheme of Messrs. Binani for the manufacture of 12,000 tons of zinc per annum from imported concentrates has been approved.

Both the Geological Survey of India and the Indian Bureau of Mines are expected to undertake intensive and rapid exploration of the known deposits of non-ferrous metals in the country and assuming discovery of fresh reserves of non-ferrous metallic ores which can sustain their extraction and exploitation over a reasonable period, creation of further capacity for the production of these non-ferrous metals is, *prima facie*, of very high priority.

According to the Industrial Policy Resolution of April, 1956, the developments in this field fall under Schedule 'A', which is the responsibility of the public sector.

The more important deposits that are proposed to be investigated are as follows:—

Deposits in Cuddapah, Kurnool and Nellore districts (Andhra Pradesh), Hazaribagh, Santal Paraganas and Monghyr districts (Bihar), Jubbulpore and Bastar districts (Madhya Pradesh), Pachekani (Sikkim), Almora and Garhwal districts (Uttar Pradesh), Udaipur district (Rajasthan), Riasi (Jammu & Kashmir), Mayurbhanj district (Orissa) and Manipur.

6. TUNGSTEN CARBIDE

Being the basis of most of the tool material, tungsten carbide occupies an important place among the strategic raw materials of the engineering industry. This carbide alloy is produced in the form of an iron grey powder of minute cubical crystals having composition W. C. sp. gr. 16, hardness 9·8 to 9·9 and melting point 5,400°F. The principal use of tungsten carbide is for tipping lathe and other cutting tools. The shaped tips are copper welded, brazed or silver soldered to a steel shank both for cheapness and support of the brittle tip. The carbide tools are used to replace diamond in oil-well boring tools.

The carbide tips are produced by diffusing powdered cobalt through finely divided tungsten carbide under hydraulic pressure and then sintering in an inert atmosphere at about 1,500°C. The briquetted material thus produced is then ground to the shape of the tips as required. The briquetting of tungsten carbide into usable form was first patented in Germany and the briquettes were produced by the Krupp Works under the name of *Widia metal*.

The primary alloy, tungsten carbide, is manufactured by adding carbon to powered metal or oxide and then heating the charge in reducing atmosphere to about 2,600°F. Close control of time and temperature is of crucial importance in the process for ensuring proper carbon absorption and appropriate particle size in the finished product.

1. Review of Progress in the Second Plan:

In the context of the emphasis on mining, metallurgical and engineering industries under the Second Plan and the perspective of accelerated developments in these fields in the following plan periods, the National Industrial Development Corporation (NIDC) did pioneering work in 1956 for the establishment of a tungsten carbide manufacturing and processing plant as part of its development activities. At the instance of the NIDC, a market survey of India was conducted in 1956 by an expert from the firm of Sandvikens of Sweden. According to the report of this expert submitted to the NIDC in February, 1957, the annual consumption requirement of tungsten carbide for cutting tools and mining tools was expected to rise from 8·5 tons in 1956 to 15·0 tons in 1960 and 25-30 tons in 1965. The level of demand as forecast was, in the expert's opinion, adequate to justify the establishment of an economic unit for the production of tungsten carbide.

With the possibilities for tungsten carbide thus established, considerable interest was shown by private enterprise for undertaking its production in the country. Applications for industrial licence envisaging the manufacture of tungsten carbide as an integral part of the production of carbide-tipped tools were made in 1959 by several entrepreneurs. The schemes were phased over from three to five years and proposed the production of tungsten carbide

in the ultimate stage from tungstic oxide manufactured indigenously from tungsten ores. The manufacturing programmes visualised under the projects licensed by the Government are briefly outlined below:

Licensed Project	Location	Manufacturing Programme	
1. M/s. India Hard Metal Corporation (in collaboration with Vickman Ltd. U.K.).	Calcutta	1. Tools from imported tips;	One year.
		2. Tips from imported powder	
		3. Manufacture of tungsten carbide from tungstic oxide (24 tons a year) . .	Two years.
		4. Tungstic oxide from ore .	Two years.
2. M/s. Sandvik Asia Ltd. (Indian Co. to be established by M/s. Sandvikens Jernverks Aktiebolag Sandviken, Sweden).	Pimpri Poona	1. Drill steels from imported tips and steel.	One year 6 months.
		2. Tips from imported powder.	3 years six months.
		3. Tungsten carbide powder from tungstic oxide (24 tons per year).	
		4. Tungstic oxide from ore.	

According to the terms of issue of industrial licence, M/s. Indian Hard Metal Corporation and M/s. Sandvik Asia Ltd., would have to supply tungsten carbide powder to other manufacturers of tips and tools starting from the carbid stage. The overall investment and the foreign exchange component for the full implementation of the two projected enterprises were estimated at about Rs. 150 lakhs and Rs. 90 lakhs respectively.

In addition to the two major units referred to above who will be manufacturing tungsten carbide tips from the ore stage onwards, approval has also been given to M/s. Indian Tool Manufacturers Limited, Bombay and M/s. Guest Keen Williams Limited, Calcutta for an annual capacity of 3 tons and 6 tons respectively for the manufacture of tips starting from the powder stage. They will be obtaining their requirements of powder from the major units referred to above when they go into production.

II. Programmes of Development in the Third Plan:

On the basis of the phasing of the implementation of the schemes outlined above, the production of tungsten carbide from tungstic oxide processed indigenously from the tungsten ores should begin in 1963-64. A capacity of 48 tons of tungsten carbide powder would be achieved by 1965-66. The production in relation to the indigenous demand is expected to be roughly 25 tons in that year.

The following table summarises the development programme for tungsten carbide powder in the Third Plan period:

	1960-61	1965-66
No. of units in operation	nil	2
Installed capacity (tons)	nil	48
Production (tons)	nil	25

MECHANICAL ENGINEERING INDUSTRIES

7. PIPES & TUBES—FERROUS

Tubular products of iron and steel find a wide range of application in industries, building & construction, public health & sanitation. Cast iron pipes are extensively used for transmission of water, gas and sewage and in culverts, drains etc., in a wide range of sizes and for varying pressures. They are particularly adapted to underground and submerged service on account of their comparatively high corrosion resistance qualities. They are more durable than bare wrought iron or steel pipes. However, when properly coated and wrapped, the steel pipe has been found to be resistent to corrosion when positioned in certain soils. To determine which of the two is the most economical material for any particular installation, the ultimate choice would have to rest on the relative cost figures for cast iron *versus* coated and wrapped steel. The tensile strength of commercial cast iron pipes is uncertain and because of its low elasticity it is not suitable for pipelines subject to the strains of expansion, contraction and vibration.

Cast iron pipes are marketted in various thicknesses and weights with (a) flanges cast-on, (b) ends threaded for screwed-on-flanges, (c) ends prepared for mechanical joint, (d) ends grooved or shouldered for patented coupling, (e) one end bell, other end spigot, and (f) one end hub, other end spigot.

Whereas the manufacture of cast iron pipes has been a fairly well established industry, the production of steel pipes and tubes has been of comparatively more recent origin in India. The present position of the two industries and the programme of development in the Third Plan are reviewed below.

1. Cast Iron Pipes

Based on methods of casting, cast iron pipes are divided into two categories-centrifugally cast pipe or popularly known as spun pipe and th pit cast or sand cast type. Like Hume pipes, cast iron pipes are also of pressure and non-pressure kinds. Pressure pipes are used for water drainage and sewage lines, while the non-pressure types is used as rain water conveyance and for soil and sanitary service.

1. Brief Survey of the Industry :

Before the war, the total production capacity of the firms engaged in cast iron pipes production was about 13,500 tons per year. Production of non-pressure types was undertaken by many of these firms. The production of pressure pipes and fittings was chiefly confined to M/s. Indian Iron & Steel Co., Kulti; M/s. Mysore Iron and Steel Co., Bhadravati and Tatanagar foundry, Tatanagar. Due to the large internal demand for cast iron pipes during the war years, and their export requirements to the Middle East Countries on the one hand and the difficulties in importing them on the other, there was a serious effort to boost up production and the annual output exceeded 40,000 tons *i.e.* more than three times the pre-war figures to cope

up with the growing demand, a spun pipe plant with an annual capacity of about 25,000 tons was installed by M/s. Indian Iron & Steel Company at Kulti. The supply position improved in 1944 with the ceasing of demands from the Middle East and the arrival of steel pipes and fittings from the United States under the Lease-Lend arrangements. There was no significant expansion of capacity during the decade following the end of the Second World War.

Capacity and Production.—During the Second Plan period three new units-M/s. Dalmia Iron and Steel Co., M/s. R. K. Industries and M/s. Baroda Rolling mills Ltd.- went into production. A second plant for larger diameter spun cast iron pipes was commissioned at the Kulti works of M/s. Indian Iron and Steel Co. Ltd. in February, 1958. A spun pipe plant with a capacity of 15,000 tons per year which forms a part of the expansion programme of M/s. Mysore Iron and Steel Works, Bhadravati was brought into operation in Nov. 1957. The progress of installed capacity in the Second Plan period is indicated by the data given below:

Annual capacity for cast iron pipes

(single shift basis)

Firm		At the beginning of Second Plan period (tons)	At the end of Second Plan period (tons)	Increase in capacity during the Second Plan period (tons)
1	2	3	4	5
West Bengal—				
1. M/s. Indian Iron & Steel Co. Ltd., Calcutta.	Sand cast	30,000	48,000	18,000
	spun	24,000	156,000	132,000
2. M/s. Shalimar Works, Howrah.	Sand cast	120	120	..
3. M/s. Dalmia Iron & Steel Ltd., Calcutta.	Spun	..	14,400	14,400
4. M/s. R. K. Industries, Calcutta	Sand cast	..	420	420
Bihar—				
5. M/s. Tata Nagar Foundry Co. Ltd., Tatanagar.	Sand cast	7,140	7,140	..
Mysore—				
6. M/s. Mysore Iron & Steel Works, Bhadravati.	Sand cast	7,200	7,320	120
	spun	..	17,000	17,000
Maharashtra—				
7. M/s. Garlick & Co., Bombay	Sand cast	500	360	—140
8. M/s. New Standard Engg. Co., Bombay (2 works)	Sand cast	3,590	3,220	—370
9. M/s. Shree Ram Mill Ltd., Bombay.	Sand cast	2,700	1,800	—900

1	2	3	4	5
Gujarat—				
10. M/s. Sayaji Iron & Eng. Co., Baroda.	Sand cast .	1,870	1,840	—30
11. M/s. Baroda Rolling Mills Ltd., Baroda.	Sand cast .	..	3,000	3,000
12. M/s. Jyoti Ltd., Baroda . .		1,200	—	—1,200
Orissa—				
13. M/s. National Foundry Rolling Mills Ltd., Cuttack.	Sand cast .	6,000	6,000	..
14. M/s. India Industries, Jatni .	Sand cast .	2,400	3,000	600
TOTAL .		86,720	269,620	182,900

It will be seen from the above table that out of the total capacity of 269,620 tons available at the end of the Second Plan period, the capacity for the manufacture of spun pipes was 187,400 tons. The balance of 82,220 tons was covered by units manufacturing sand cast pipes and specials. The units manufacturing sand cast pipes are older units which were established at a time when the capacity for spun pipes was very small. With the rise in the production of spun pipes, a gradual decrease in the production of sand cast pipes is being noticed. This is mainly because of the customers preference for the spun pipes on account of their lighter weight, lower price and superior quality in general.

The production of cast iron pipes in the decade ended 1960 expanded as shown below:

	Tons
1951	56,105
1955	96,692
1956	108,605
1957	116,747
1958	138,350
1959	163,850
1960	209,110

Of the production in 1960 167,677 tons related to spun pipes and the balance was for cast iron pipes and specials. It would thus be observed that the capacity for sand cast pipes & specials was utilised to the extent of only 50%, while that for spun pipes was as high as 90%. During the Second Plan period there was considerable diversification of the production of the cast iron pipes to meet the demands for different categories. The Kulti works of IISCO which was manufacturing spun pipes of 3" to 8" and 14" diameters during the First Plan period, took up the manufacture of spun

pipes up to 30" diameter during the last two years in their new plant. Similarly, other firms also took up manufacture of pipes of various diameters and there was a definite shift in the pattern of production to cover the bigger diameter ranges.

Imports.—According to the monthly statistics of Foreign Trade of India, the imports of pipes and fittings of cast and malleable iron in the last four years were as follows:

	'000 tons
1957	27
1958	6
1959	3
1960	2

The imports of cast iron pipes and fittings in 1960 were valued at about Rs. 57 lakhs.

Based on the production & import figures, the availability of cast iron pipes during 1960 came to 212,000 tons.

Investment.—The present total investment of the existing 13 cast iron pipe plant is estimated at about Rs. 6·9 crores of which about Rs. 5·9 crores would be the capital expenditure on plant and machinery.

II. Programme of development in the Third Plan period:

Estimated demand and Targets.—The National Council of Applied Economic Research (NCAER) while determining the off take of cast iron pipes based on indigenous production and imports found that the trend of demand followed a straight line and they used it as the basis for projecting the future requirements of cast iron pipes. According to the NCAER estimates the demand for cast iron pipes by 1965-66 would go up to 5·1 lakh tons including an exportable surplus of 2 lakh tons.

The requirements of the country for cast iron pipes were revised subsequently and it was felt that they could be placed at 8 lakh tons per annum by 1965-66 including an exportable surplus of 2 lakh tons. On the basis of this review, the target for capacity and production was proposed at 8 lakh tons for this industry under the Third Plan.

Schemes licensed and under implementation.—With the realisation of the growing importance of the cast iron pipe industry, many schemes were proposed by the private sector to expand the capacity of some of the existing

units as well as for putting up new factories. The Statewise distribution of the newly licensed capacity is given in the following table. The capacity figures are on double shift basis.

State	Spun pipes		Sand cast pipes	
	No. of units	Annual capacity (tons)	No. of units	Annual capacity (tons)
West Bengal	3	119,600	1	1,800
Bihar	2	38,400	1	6,000
Orissa	2	22,020	..	..
Andhra Pradesh	3	52,080	..	..
Madhya Pradesh	3	120,000	..	..
Punjab	3	54,000	..	..
Maharashtra	5	92,400	..	..
Gujarat	3	66,000	2	2,000
Uttar Pradesh	3	78,000	1	6,240
Madras	4	51,200	..	..
Rajasthan	2	54,000	..	..
Kerala	1	18,000	..	..
TOTAL	34	765,700	5	16,040

A few important producers are listed below:

		Licensed capacity (tons)
M/s. Dalmia Iron & Steel Ltd., Calcutta	Spun pipe	75,600
M/s. Indian Iron & Steel Co. Ltd., Calcutta	Do.	60,000
M/s. New Swadeshi Mills Ltd., Calcutta	Do.	36,000
M/s. Kesoram Cotton Mills Ltd., Calcutta	Do.	30,000
M/s. Textile Machinery Corp. Ltd., Calcutta	Do.	30,000
M/s. Gayday Iron & Steel Co., New Delhi	Do.	30,000
M/s. Somani Industrial Enterprises, Calcutta	Do.	30,000
M/s. Central Indian Machinery manufacturing Co., Gwalior.	Do.	30,000
M/s. Kalani Iron & Steel Co., Indore	Do.	30,000
M/s. Khandelwal Ferro Alloys, Ltd., Bombay	Do.	30,000
M/s. J. K. Commercial Corp. Ltd., Kanpur	Do.	30,000

In view of above it is felt that there will be no difficulty in the realisation of the envisaged target. The minimum economic unit for a cast iron spun pipe plant is estimated at 24,000 to 30,000 tons per annum on double

shift basis. The total investment including plant and machinery, land and building etc. for such a unit is estimated at about Rs. 65 lakhs out of which Rs. 50 lakhs would be absorbed on plant and machinery including imported plant and machinery of about Rs. 35 to 40 lakhs. The main items of machinery required to be installed would be hot blast cupolas, cranes and hoists, mould boring lathes, centrifugal pipe spinning machines, annealing furnaces, hydraulic testing machines etc.

Raw materials.—By providing for an allowance of 20%, the estimated requirement of pig iron for the targetted production of cast iron pipes comes to 9·6 lakh tons annually.

II. Steel Tubes

The variety in steel tubes is large and it covers size, wall thickness, kind of steel used, type of joint, protective coating, manufacturing process and end use. Based on manufacturing process, steel tubes can be categorised as welded type and seamless type. With the improvements in different welding techniques-electric fusion welding, electric resistance welding, submerged arc electric welding etc.-welded tubes are rapidly replacing the seamless type, whose use is at present mainly confined to selected special applications.

Welded tubes of diameter over 20" are used in India mostly for pen stocks and primary water mains; these are generally made *in situ* and by plate fabricators. Line tubes used for main lines of water transmission are mostly of 10" and 12" in diameter, while those for oil lines are 8" to 20" in diameter and are made to the rigid specifications of the American Petrolium Institute. Welded structural tubes and commercial tubes can be of various sizes. Commercial tubes used for conveyance of water and gas vary from ½" to 12" in diameter; those for agricultural purposes are usually 3" and 4" size and for the tubular poles the sizes used are 4" to 8". Special tubes used in the manufacture of cycles, furniture, refrigerator equipments and transformers are generally made from cold rolled strip.

1. Brief Survey of the Industry:

The manufacture of steel pipes in the country was undertaken on a small and intermittent basis until the two newcomers, M/s. Kalinga Tubes and M/s. Indian Tube Company entered the field in 1955. The combined capacity of these two units at the end of the First Plan was 60,000 tons per annum on single shift basis. M/s. Kalinga Tubes were equipped to produce pipes of diameter varying between 1/2" and 2" in six range and the Fretz Moon plant of M/s. Indian Tube Company had facilities provided for the manufacture of welded tubes upto and including 3" nominal bore. The expansion programmes envisaged by both the firms under the Second Plan were outlined on page 18 of the Volume on the Programmes of Industrial Development, 1956-61.

The expansion programme of M/s. Kalinga Tubes for the production of pipes of 2½" to 6" diameter has been implemented by about the start of the Third Plan and trial production of the mill was commenced. The delay as compared to the schedules envisaged in 1956 was due to late deliveries of plant and machinery by suppliers abroad. As regards M/s. Indian

Tube Company, the installation of the E.R.W. plant for the manufacture of electric resistance welded tubes and the cold rolling mill for the manufactures of strip was completed in August, 1957. The plant for the manufacture of seamless tubes was commissioned in March, 1959. The schedules envisaged for the expansion programmes of M/s. Indian Tube Company were broadly kept up and its total investment during the Second Plan period amounted to Rs. 4·93 crores.

Apart from the expansion carried out by M/s. Kalinga Tubes and M/s. Indian Tube Company, three new units were installed in the Second Plan period. Of these, mention may be made of the pipe plant of M/s. Tube Products of India Ltd. Madras with an installed capacity of 9,000 tons per year and the pipe plant of Hindustan Steel Ltd. at Rourkela with an annual capacity varying between 120,000 to 180,000 tons of pipes per year depending on the size of diameter of the tubes manufactured in the range of 8 to 20 inches diameter. The investment on the pipe mill which forms part of the expenditure on the Rourkela Steel works is placed at Rs. 4·0 crores. At the end of the Second Plan, the installed capacity for pipes and tubes totalling 359,150 tons was distributed between 10 plants as indicated below :—

Firm	Installed Capacity (tons)
West Bengal—	
M/s. Indian Tube Co. Ltd., Calcutta	127,170
M/s. Kalinga Tube Ltd. Calcutta	30,000
M/s. Shri Hanuman Industries, Howrah	4,700
M/s. Shankar Industries, Calcutta	460
Orissa—	
Hindustan Steel Ltd., Rourkela	120,000 to 180,000
Bombay—	
M/s. Godrej & Boyce Ltd., Bombay	3,000
M/s. Premier Automobiles Ltd., Bombay	3,000
Madras—	
M/s. Tube Products of India Ltd., Madras	9,000
Uttar Pradesh—	
M/s. R. N. Gupta & Co., Lucknow	1,200
M/s. Reliable Water supply service of India, Lucknow	620
TOTAL	299,150 to 359,150

The production of steel pipes has nearly doubled in the Second Plan period as would be seen from the following data relating to the yearly output since 1956.

('000 tons)

1956	46
1957	62
1958	90
1959	72
1960	96

Of the total production in 1960, about 86.000 tons were tubes below 6" diameter. A substantial part of this output was again in sizes upto 3" diameter, which is the maximum that could be produced out of the skelp made at TISCO's skelp mill. Within the overall total output in 1960, the share of seamless tubes of 2-3/8" to 6-5/8" of diameter amounted to 9,000 tons.

The production of pipes at the Rourkela pipe plant of the Hindustan Steel Limited was additional to the output data given above. It amounted to about 15.000 tons in 1960. The pipes produced at this plant conformed to the A.P.I. specifications and were partly utilised in the construction of the crude pipeline from Naharkatiya to Barauni.

Imports.—The import of steel and wrought iron tubes of various categories, galvanised or ordinary as recorded in the Monthly Statistics of Foreign Trade of India, is given below:

('000 tons)

1957	35·3
1958	27·5
1959	42·8
1960	80·7

The import figure of 1960 corresponds to Rs. 9·2 crores worth of steel and wrought iron pipes and tubes. There are no data available about disguised imports of those products forming part of the imports of complete plant and machinery. These are roughly placed at about 15.000 to 20.000 tons in 1960. Based on the production and import figures, the availability of steel pipes during 1960 comes to 177.000 tons. Taking into account the estimated figure of disguised import also, the availability of the steel pipes and tubes in 1960 can be taken to be 2 lakh tons approximately.

Problems of the Industry.—The following difficulties faced the indigenous manufactures in running their plants:

(i) Short supplies of zinc, spare parts and tools not available in India;

(ii) Inadequate supply of plates, strips and billets;

(iii) Shortage of railway wagons for despatch of finished items from the works.

II. Programme of Development in the Third Five Year Plan:

Estimated Requirements.—The pattern of industrialisation has considerable influence on the levels of demand for different end products of steel. Broadly speaking, the demand for steel pipes and tubes grows in importance with emphasis on chemical and mineral oil industries in the scheme of industrial development. The somewhat steep increase in the demand for pipes and tubes in 1960 and 1961 is a consequence of the work on the construction of pipe lines for oil (Naharkatiya-Baruni crude oil pipe line) and coke oven gas (Durgapur-Howrah pipe line for gas).

In the Steel Demand Appraisal, the National Council of Applied Economic Research (NCAER) estimated the demand for skelp in the manufacture of tubes and pipes below 6 inches diameter for 1965-66 at 3·3 lakh tons. The break-up of the total requirements for skelp by end-use is given in the following table.

End Use	Requirement by 1965-66 (tons)
Bicycles	12,400
Conduit pipes	9,300
Steel Furniture	4,300
Boiler Tubes	15,400
For transformers and fans	8,100
Coal and other mining machinery	11,000
Water Pipes	250,000
Others including automobiles and other constructional uses	19,500
TOTAL	330,000

The above corresponds to pipes and tubes of about 3 lakh tons. The question of future demand for steel pipes and tubes was gone into more recently and the Development Wing of the C. & I. Ministry estimated the requirements for the last year of the Third Plan at 900,000 tons.

Allowing for a doubling of the effective demand for pipes of all categories which obtained in 1960, it is felt that the requirements in 1965-66 might be about 450,000 tons. Within this overall demand, the requirements of seamless tubes and pipes are visualised at 40,000 to 50,000 tons. It may be pointed out that if full scope is given to the operation of the trends in favour of tubular products as substitutes for conventional structural fabrications, the demand for pipes and tubes could rise further. It would, however, be difficult to increase the output of flat products in the Third Plan period correspondingly.

Target.—On the basis of the requirements as estimated above, a production target of 450,000 tons of steel tubes per annum has been proposed for the Third Plan. A capacity of the order of 450,000 to 510,000 tons based on double shift operations of the plants installed is expected to meet the requirements of the situation under this industry.

New capacity licensed.—On the basis of the target for capacity suggested in the preceding paragraph, the gap in installed capacity requiring to be filled in the Third Plan period would be about 150,000 tons per year. This would mainly have to be in the sizes below 8" diameter since the Rourkela pipe plant will be capable of fully meeting the demands in the higher diameter ranges.

During the Second Plan period, 24 more schemes have been licensed. Of the licensed units foreign exchange clearance has been given to the following nine schemes:

	Licensed Capacity on double shift basis (tons)
M/s. Kesoram Cotton Mills Ltd., Calcutta	60,000
M/s. Godrej & Boyce Mfg. Co. Ltd., Bombay	1,200
M/s. Khandelwal Ferro Alloys Ltd., Bombay	48,000
M/s. Grant James Ltd., Calcutta	12,000
M/s. Indian Conduit Industries, Panipat	6,000
M/s. Kalinga Tubes Ltd., Calcutta	48,000
M/s. Zenith Steel Pipes Ltd., Bombay	24,000
M/s. Gujarat Steel Tubes Ltd., Bombay	24,000
M/s. Bombay Steel Tubes Ltd., Bombay	12,500
TOTAL	235,700

No foreign exchange is involved in the following three schemes :

	Licensed capacity on double shift basis (tons)
M/s. Ispat Mills Ltd., Bharatpur	1,440
M/s. K. C. P. Ltd., Madras	5,000
M/s. New Standard Engineering Co., Bombay	12,000

In respect of the other twelve schemes CG Committee is yet to consider the release of foreign exchange for imports of capital equipment.

Overall position.—With the implementation of the schemes covered by foreign exchange and requiring no foreign exchange as mentioned above, the annual capacity of the industry would increase to 5·53 to 6·13 lakh tons on double shift basis. The above will thus more than amply meet the envisaged target even if a few of the schemes do not materialise.

Raw Materials.—Billets are used for small size seamless tubes and ingots for large size ones. The raw materials for welded tubes are plates and strips. Strips are used in the manufacture of welded tubes up to 6" outside diameter. For tubes between 6" and 12", both strips and plates are used depending on the wall thickness. For tubes of large size only plates are used.

150,000 tons of foreign blooms and billets will be available after expansion of Bhilai and Durgapur in 1964-65, from which the requirements for seamless tubes can be met.

About 1,000 tons of stainless steel blooms will be available by 1965-66 from the new Alloy and Steel Works. This should meet the entire demand of seamless tubes.

The installed and licensed units will together require for the targetted production of welded tubes about 4·4 lakh tons of skelp and strips. Tube plants depending on strip as the raw material would have to be equipped with slitting machines for cutting the strips to the required sizes of diameter.

The availability of skelp will go upto about 250,000 tons per year with the supplies becoming available from the mill proposed for erection under the expansion programme of the Durgapur Steel works.

Investment and employment.—Additional total investment during the Third Plan period for the realisation of the targetted capacity has been estimated to be about Rs. 4·5 crores of which about Rs. 3·5 crores will be for capital equipment and machinery. Additional employment in this industry during the Third Plan period may be 4,000 approximately.

8. STEEL WIRE

The development programme for this industry covers mild steel wire, high tensile steel wire and welding electrodes *i.e.* electrode core wire.

Steel wire is the basic raw material for the manufacture of various household and industrial articles such as screws, bolts, nuts, nails, pins and springs. It is also used for re-inforcements in ferro-concrete constructions, an application which has recently come to the fore-front in this country. Welding electrodes made of special mild steel electrode wire constitute an important requirement for welding operations which is being increasingly adopted in place of rivetting resulting in considerable steel economy in the fabricational field. The demand for steel wire in the traditional uses *e.g.*, fencing, ordinary and barbed wire, has also expanded. Wire and wire products have become a subject of considerable interest in the industrial field in recent years. In the following section, mild steel wire and high tensile steel wire are dealt together and welding electrodes separately.

I. Steel Wire

Mild steel wire of low carbon content (upto 0·25% carbon) is widely used for wire nails, panel pins, screws, bolts, nuts, rivets, barbed and stranded wires, wire gauge and netting, B.R.C. fabrics, welding electrodes, steel chains, welding and domestic hardware items, etc. High tensile steel wires are drawn from steel rods of carbon content exceeding 0·3%. Special steel wires drawn from high carbon steel and alloy steel also come under this category. High tensile steel wires have got demand for wire ropes, prestressed concrete, A.C.S.R. conductors, bicycle spokes and saddles, rubber tyres, umbrella ribs, coil springs, high tensile bolts, cotterpins, and needles.

1. Review of Progress in the Second Five Year Plan:

The demand of steel wire and wire products was envisaged at 1,00,000 tons by the end of the Second Plan period. It was envisaged that the capacity for steel wire under the re-rollers would be expanded by 55,000 tons and the demand would thus be fully met (page 22 of the Volume on Programmes of Industrial Development: 1956-61).

New capacity of 25,000 tons per year on double shift basis, of which about 8,000 tons are for high tensile steel wire, was created in the Second Plan period. The present installed capacity on double shift basis is indicated below:

Firm	State	Annual capacity (tons)
1	2	3
M/s. Indian Steel and Wire Products Ltd., Jamshedpur.	Bihar . . .	75,000
M/s. Hindusthan Wire Netting Co., Bombay .	Bombay . .	9,600
M/s. Guest Keen Williams Ltd., Calcutta and Bombay.	(i) West Bengal	9,600
	(ii) Bombay .	3,300

1	2	3
M/s. Hind Wire Industries, Sodepore	West Bengal	5,400
M/s. National Rolling & Steel ropes Ltd., Shyam Nagar.	West Bengal	5,280
M/s. J. K. Steel Ltd., Risra	West Bengal	3,000
M/s. Indian Steel Rolling Mills Ltd., Nagapattam	Madras	6,000
M/s. Bawa Iron & Steel Works, Sonepat	Punjab	3,000
M/s. Badhawar & Co., Delhi	Delhi	3,000
	TOTAL	123,180

Of the above, 18,000 tons are for high tensile wire drawing capacity.

The production of steel wire in the Second Plan period, as indicated below, was considerably short of the requirements in almost every year and had to be supplemented by imports.

Indigenous Production and Imports of Steel Wire

	Production (tons)	Imports (tons)	Indigenous availability (tons)
1956	35,867	70,048	105,915
1957	36,873	53,363	90,236
1958	34,007	47,136	81,143
1959	41,841	54,549	96,390
1960	39,506	116,240	155,746

II. Programme of Development in the Third Plan period:

Estimate of requirements.—The estimate of future demand for steel wire was recently gone into by two specialist bodies as outlined below.

On the basis of the end-use approach and assuming specific levels of growth under industries and related sectors the Wire Panel set up by the Ministry of Commerce & Industry in 1960 made the demand forecast for steel wire by 1965-66 as follows :—

	Estimate of demand in 1965-66 (tons)
Mild steel wire	340,000
Medium and high carbon wire	124,500
Special steel wire	5,200
TOTAL	469,700

Of the above, 30,000 tons of mild steel wire have been accounted for welding electrodes and 40,000 tons of the medium and high carbon grade for steel wire ropes.

The National Council of Applied Economic Research (NCAER) examined the demand for steel wire arising in various sectors of the economy and estimated the requirements of wire and wire products in 1965-66 as 264,000 tons, of which 52,000 tons will be in the special steel wire category. According to the NCAER, the sector-wise requirements would be as follows (*vide* page 216 of the Steel demand Appraisal).

	(tons)
Large Scale Industries	164,000
Small Scale Industries	43,000
Transport & Communications	11,000
Housing and Construction	16,000
Power Projects, irrigation, agriculture, etc.	30,000
TOTAL	264,000

As against the background of the demand situation in 1960 indicated by the total availability of steel wire in that year and assuming an average of 20 per cent increase in demand per year in the Third Plan period, the requirements for 1965-66 are envisaged by the Planning Commission at 400,000 tons. This is inclusive of the welding electrodes.

Targets.—The overall target of 400,000 tons proposed for steel wire is expected to enable the production of 300,000 tons of wire of mild steel category and 100,000 tons of medium and high carbon and special steel categories.

Schemes approved for implementation.—A number of new schemes have been licensed in accordance with the Industries (Development and Regulation) Act. Under the Iron & Steel Control Order, many small-scale units have also been sanctioned for drawing wire. The details are given below, statewise, and with capacity reckoned on double-shift basis.

State	Capacity licensed under Industries (D & R) Act		Capacity sanctioned in small scale sector under I & S (C) Order, 1956	
	No. of Units	Capacity (tons)	No. of Units	Capacity (tons)
1	2	3	4	5
Andhra	2	3,000	1	1,000
Assam	1	2,400	..	..
Bihar	1	7,200	4	12,000
Delhi	3	11,200	3	9,000
Gujarat	1	10,000	2	5,400
Kerala	1	4,000	..	..
Madhya Pradesh	2	8,900	..	..
Madras	1	1,200	1	3,000
Maharashtra	10	42,576	4	6,760

1	2	3	4	5
Orissa	..	..	3	9,000
Punjab	2	9,200	10	28,680
Rajasthan	..	..	2	6,000
Uttar Pradesh	3	8,976	..	..
West Bengal	5	18,400	2	6,000
TOTAL	32	127,052	32	86,840

Further addition to the capacity is also envisaged to the extent of 50,000 tons as a result of the modernisation and expansion programme of M/s. Indian Steel Wire Products to which reference has been made in the development programmes of the re-rolling industry under Iron and Steel. Out of the above new capacity sanctioned, it has not been possible to ascertain the exact tonnages of high tensile and other special categories of wire proposed to be drawn.

In accordance with relaxations announced by the Government in April, 1960 last, manufacture of wire on a small scale in factories employing less than 50 people has been freely allowed. It has not been possible to ascertain the capacity that may arise in this sector as a result of the above relaxations.

Before consideration is given to the question of approving additional capacity under this industry, it is necessary that a clear picture in regard to these two aspects is obtained by making the necessary studies and investigations.

Raw Materials.—To draw 4 lakh tons of steel wires, 4·1 lakh tons of steel rods are required of which one-third will be medium and high carbon type. Wire rod, the raw material of the wire drawer, is hot rolled from steel billets. The size and the quality of the wire rod would determine, in the first instance, the kind and size of the wire that could be produced. The survey made by the Wire Panel for each specific industry under mild steel group has revealed that for about 20% of the requirement of wire under the mild steel group, the wire rods would be of above 1/4" diameter. The balance of the requirements of wire would be drawn from the wire rods of 1/4" and below. In the case of medium and high carbon and special steel wire, about 75% of the requirements would have to be drawn from wire rods of 1/4" and below and 25% would have to be drawn from wire rods of above 1/4" diameter.

The price of mild steel rod is about Rs. 600 per ton as against the average price of Rs. 1,000 per ton of mild steel wire. The corresponding figures for rods and wires of the high tensile category are Rs. 900 per ton and Rs. 1,300 per ton respectively.

Investment.—The total investment in this industry inclusive of welding electrodes for the realisation of the targetted capacity has been estimated to be about Rs. 7·5 crores.

II. Welding Electrodes

11. Review of progress in the Second Five Year Plan:

Special mild steel wire of composition—0·06 to 0·1% carbon, 0·4 to 0·55% manganese, and not more than 0·03% each of phosphorus and sulphur and having traces of silicon—is the basic raw material for the welding electrodes. This low carbon steel of specific chemical analysis is at present imported in the form of billets and rolled by M/s. Indian Steel and Wire Products, Ltd., Jamshedpur, into wires which are supplied to the welding electrode manufacturers according to the gauge-wise requirements.

The manufacture of welding electrodes is of recent development in India. At present there are only two firms—M/s. Indian Oxygen Ltd. and M/s. J. B. Advani 'O'erlikon Ltd.—engaged in its manufacture. The growth of the annual installed capacity and the annual production since 1950 are indicated in the table below. The capacity figures are on double-shift basis and in million running feet. (M.r. ft.):

	Installed capacity (M.r. ft.)	Production (M.r. ft.)
1950	30·0	22·6
1955	96·0	121·6
1956	96·0	187·0
1957	113·0	212·8
1958	233·0	236·8
1959	420·0	270·2
1960	420·0	362·2

It will be seen from the above that a capacity of about 320 M.r. ft. on double-shift basis was created during the Second Plan period and the production registered a two-fold increase. The production of welding electrodes in 1960 was valued at about Rs. 1·9 crores.

The imports of welding electrodes (iron or steel) coated and uncoated, as given in the Monthly Statistics of Foreign Trade of India, are given below:

	Cwt.	Value in Rs. lakhs
1957	17,441	33·85
1958	9,123	18·47
1959	6,508	13·08
1960	8,985	18·29

Import figure for 1960 may be taken to be roughly equivalent to 14 M.r. ft.

Based on a production of 362 M.r. ft. and an import figure of 14 M.r. ft. the consumption of welding electrodes during 1960 can broadly be taken to have been about 376 M.r. ft.

II. Programme of development in the Third Five Year Plan :

Estimate of requirements.—The forecast of future demand for welding electrodes was discussed with the representatives of the various interests concerned at a conference convened by the Planning Commission. Adopting the norm considered by the National Council of Applied Economic Research (NCAER) *i.e.* welding electrode forms 0·44 per cent of the tonnage of finished steel output, the demand in 1965-66 should be equated to 30,000 tons corresponding to 940 M.r. ft. Based on above, the requirements of welding electrodes in 1965-66 have been envisaged at 900 M.r. ft.

Targets.—A production target of 900 M.r. ft. and a capacity target of 1,080 M.r.ft. by 1965-66 have been envisaged for this industry so as to meet the demands in full from indigenous sources. Out of these, the share of special welding electrodes has been placed at 5%.

Scheme licensed and under implementation.—A number of schemes designed to increase the capacity of this industry has been already licensed under the Industries (Development and Regulation) Act. The details of the schemes approved, which are in varying stages of implementation, are given below. The capacity figures are on single shift basis :

Firm	Licensed capacity (M.r. ft.)
M/s. Modi Vanaspati Manufacturing Co., Modinagar	32.4
M/s. Industrial Gases Ltd., Calcutta	10.0
M/s. Power Cables Ltd., Kalyan	120.0
M/s. Indian Oxygen, Calcutta	12.0
M/s. Harshadraj Ltd., Bombay	5·0
M/s. J. B. Advani Oerlikon Electrodes Ltd., Bombay	91·2
M/s. Union Engineering, Madras	40·0
TOTAL	370.6

Additional Capacity required.—With implementation of the schemes mentioned above, the annual rated capacity of the industry would increase to 1,087 M.r. ft. on double-shift basis. There is as such no scope for further expansion of this industry.

Raw Materials.—The requirements of core wire are estimated at 32 tons per M.r. ft. of 8 SWG electrodes. Using this average figure and taking 20% as the loss on the billets in the wire drawing operations, the demand for billets *vis-a-vis* the production target comes to 34,500 tons per annum. These billets of special quality have been kept in view under the expansion programme of the Bhilai steel works. They can also be expected to be produced by the re-rollers operating in conjunction with electric furnaces.

Investment and Labour.—Total investment during the Third Plan period has been estimated to be Rs. 120 lakhs of which Rs. 40 lakhs would be the foreign exchange. Employment for this industry by the end of the Third Plan period has been estimated at 1,000.

9. STEEL WIRE ROPES

Steel wire ropes have wide applications in the engineering industry. Wire ropes of various sizes are required for general engineering, hoisting, coal mining machinery (haulage and winding), marine and shipping (inland and ocean going), ropeways, oil well drilling, bull dozers, drag lines and excavators. Attention to steel wire ropes manufacture is a logical corollary to the emphasis on machinery manufacturing programmes under the Third Plan.

I. Review of Progress in the Second Plan:

Demand.—The demand of steel wire ropes by 1960-61 has recently been estimated at 10,000 tons per annum by the Standing Committee for Machinery Manufacture for Engineering Industries. A development programme for this industry was not formulated in 1956, but its growth was fostered on an *ad hoc* basis.

Capacity and Production.—During the Second Plan period manufacture of steel wire ropes was started indigenously by two firms M/s. National Ropes and Steel Rolling Ltd., Calcutta and M/s. J. K. Steel Ltd., Calcutta. Their total capacity is 6,120 tons per annum on two shift basis. The production of wire ropes was:

	(tons)
1956	743
1957	1,118
1958	1,557
1959	2,750
1960	3,280

Import.—The import policy for established importers of wire ropes during April-September, 1960 and October-March, 1961 was 30% and 20% respectively of the maximum import of a concern during the past years and in addition actual users are being allowed to import reasonable requirements of wire on restricted basis depending upon the availability of foreign exchange. Present level of import has been estimated to be Rs. 80-90 lakhs per annum. This will roughly be equivalent to 4,000 tons.

Employment.—Total employment in this industry in early 1961 has been estimated to be 350.

II. Programme of Development in the Third Plan:

The demand of steel wires has been estimated to rise to 40,000 tons per annum by 1965-66 from a general appreciation of the impact of growth of engineering industries as visualised under the Third Plan. Accordingly, a target of 40,000 tons per annum has been envisaged for this industry by 1965-66.

New Capacity approved for implementation.—Licences for substantial expansion of M/s. J. K. Steel and establishment of new units have been issued for a total capacity of about 32,500 tons as shown below :

Firm	Annual capacity on double shift (in tons)
M/s. J. K. Steel Ltd., Hooghly	3,000
M/s. Indian Steel and Wire Products Ltd., Tatanagar	4,320
M/s. Usha Martin Black (Wire Ropes) Ltd., Ranchi	3,600
M/s. B. R. Herman and Mohatta, Bombay	3,000
M/s. Fort William Jute Co., Howrah	3,000
M/s. H. K. Industries, Ltd., Bhandup	3,000
M/s. Techno-equipment, Bombay	3,000
M/s. McLeod & Co., Calcutta	3,000
M/s. United Wire Ropes Ltd., Bombay	3,600
M/s. Seshasayee Brothers, Ernakulam	3,000
TOTAL	32,520

Of the above M/s. Usha Martin Black, M/s. United Wire Ropes and M/s. Fort William Jute are expected to come into production by about the middle of 1962. A minimum economic unit for wire rope manufacture is visualised at 3,000 tons per annum on two shift basis and the capital goods for plant and equipment of such unit is estimated at Rs. 32-35 lakhs. It is thus felt that additional 3,000-5,000 tons of annual capacity can be created without difficulty by the implementation of some of the schemes already submitted for licensing so as to achieve the target.

Investment.—It has been estimated that during the Third Plan period a total of Rs. 1·8 crores will be invested of which Rs. 1·0 crore will be on account of plant and equipment. Plant and machinery for replacement will account for another Rs. 0·2 crore during the Third Plan period.

Raw Materials.—40,500 tons of high carbon steel rods of 0·1% to 0·8% carbon content represent the main raw material requirements of this industry. The price of high carbon steel rods is about Rs. 900 per ton as against Rs. 3,000 the average price of the steel wire rope per ton.

Employment.—Total employment by 1966 in this industry has been estimated to rise to about 1,000.

The following table summarises the development of steel wire ropes industry during the period of the Third Plan. The figures are on two shift basis :—

	1960-61	1965-66
Annual capacity (tons)	6,120	40,000
Annual production (tons)	3,280	40,000

10. CASTINGS AND FORGINGS

The scope of the development programme for the industry for the manufacture of castings and forgings would cover grey iron (including malleable iron) castings and steel forgings. The growth of these industries is closely linked with the manufacture of railway rolling stock, automobiles, durable consumer goods and industrial machinery. Foundry and forgeshops come into existence as captive establishments under the major consumer industries or alternatively as independent units catering to the demands of a wide range of customers. Both patterns of development of foundry and forgeshops have their place in a developing economy and investment decisions will have to be governed by the situation existing from time to time and in different regions of the country.

The foundary and forgeshops in operation so far have been almost wholly specialising in the manufacture of light and medium castings and forgings and there is no indigenous production of these items in the heavier ranges which have so far been imported as integral parts of machinery and equipment procured from abroad.

1. Review of Progress in the Second Plan:

Targets.—The report of the Second Five Year Plan did not lay down specific overall targets for castings and forgings, but assigned high priority to these items since they form part of machinery manufacturing programmes. As programmes within the public sector for the manufacture of heavy castings and forgings, reference was made to the heavy foundry for steel castings proposed for establishment under the Chittaranjan Locomotive Factory and to the scheme of the National Industrial Development Corporation (NIDC) for heavy foundry-forgeshops envisaged to produce about 15,000 tons of steel castings, 12,000 tons of forgings and 10,000 tons of grey iron castings per year, for which a provision of Rs. 12 crores was tentatively envisaged. The objective of the NIDC scheme was that by the establishment of these facilities as nuclei at the few centres, the production of heavy machinery could be fostered and given a fillip in the country.

In the private sector, the major scheme for medium and heavy steel castings projected under the Second Plan was that of M/s. Tata Engineering & Locomotive Works (TELCO) to meet *inter alia* its own internal demand for castings under the locomotive manufacturing programme.

Capacity and Production

Developments in the Public sector—In 1958 the Hindustan Machine Tools (HMT) was allowed to establish a grey iron foundry for meeting its growing demand for iron castings. Due to foreign exchange difficulties the project could not be taken up for some time. The HMT foundry will have a capacity of 6.000 tons per year and involve an investment of Rs. 60 lakhs. Orders have been placed for the purchase of plant and equipment in 1960. Civil Works at plant site were in progress by the end of the Second Plan.

The foundry of the Chittaranjan Locomotive Works on which also, action was somewhat delayed due to the foreign exchange difficulties will spill over into the Third Plan. It will have an annual capacity of 3,000 tons for grey iron castings and 10,000 tons for steel castings.

Along with the three steel plants in the public sector, capacity has been developed in overall terms for 75,000 tons of grey iron castings and 15,000 tons of steel castings. Ingot moulds will be the major item of production under grey iron castings. The construction of the foundry shops at the steel works was completed in 1960-61.

Schemes of the NIDC.—The thinking on the manner in which facilities for the manufacture of heavy machinery plant equipment should be brought into being whether through integrated works or through a large number of independent workshops specialising in the production of machinery on a functional basis has crystallised itself in 1956 in favour of building up integrated plants for machine building. As a logical corollary, there was a shift in favour of captive foundry/forgeshops as under the Mining Machinery Project at Durgapur and a physically integrated, though independent heavy Foundry/Forgeshop at Hatia near Ranchi along with the Heavy Machinery Plant. The capacities of these two units had to be planned against the background of the demand from these two machinery plants and the optimum scales of operation necessary for securing production at a favourable cost. Though the foreign exchange was arranged for these projects under the U.S.S.R. and Czech credits fairly early under the Second Plan, the preparatory work entailed considerable time and therefore, the establishment of these two shops will materialise only by about the middle of the Third Plan.

The installed capacity for grey iron castings and steel castings in the public sector by the end of the Second Plan was 81,000 tons of the former and 25,000 tons of the latter. Of this total, 6,000 tons of grey iron castings was from small foundries excluding those attached to the railway workshops. There is no capacity for steel forgings in operation in the public sector at the end of the Second Plan.

Developments in the private sector

Steel Castings.—The major steel foundry in the private sector installed in the Second Plan period is that of TELCO near Jamshedpur. The manufacture of steel castings commenced in 1957 and the alloy steel foundry went into production in 1959. An investment of Rs. 4 crores was made on this project for which the advances from the Ministry of Railways amounted to Rs. 2 crores. An output of 3,800 tons of the steel castings and 3,700 tons of iron castings was achieved in 1959-60. Besides supplying Company's own requirements of steel castings for locomotives, the TELCO foundry supplied castings to the Chittaranjan Locomotive Works, the Integral Coach factory at Perambur, to cement companies and other concerns.

The following new capacities for steel castings materialised during the Second Plan period:

Firm	Annual capacity (tons)
M/s. Burn & Co., Howrah	6,000
M/s. Tata Engineering and Locomotives, Jamshedpur	6,000
M/s. Dalmia Iron & Steel Co., 24 Parganas (W. Bengal)	4,500
M/s. Mukund Iron & Steel Works, Bombay	4,200
M/s. Ashoka Cement Ltd., Bihar	1,480
M/s. Kusum Engineering Co., Calcutta	1,200
M/s. Hindustan Iron & Steel, Co., Calcutta	Yet to be assessed.
TOTAL	23,380

There are at present 16 units producing steel castings and their installed capacity is 39.000 tons. The production of steel castings during the last few years was as given below:

	(tons)
1955	15,000.
1956	20,500
1957	23,300
1958	28,100
1959	29,000
1960	33,500

Steel Forgings.—During the Second Plan period the following additions to capacity for steel forgings have been made:

Firm	Annual capacity (tons)
M/s. Kumar Engineering, Bombay	180
M/s. National Alloy and Metal Works, Calcutta	420
M/s. Binnys Engineering Works, Madras	960
TOTAL	1,560

Accurate statistics relating to the steel forgings are not available. The output for 1960-61 has been estimated at 35,000 tons. At present there are 28 units undertaking steel forging operations. The statewise break-up of the present annual installed capacity is given below:

State	Existing annual capacity (tons)
West Bengal	34,100
Uttar Pradesh	3,000
Madras	1,300
Andhra	1,100
Kerala	900
Delhi	900
Punjab	500
Maharashtra	500
TOTAL	42,900

Grey Iron Castings.—A capacity of 3·7 lakh tons of grey iron castings was added during the Second Plan period. The State-wise distribution of the present capacity as registered with the Development Wing of the Ministry of Commerce & Industry is given below:

State	Existing annual capacity (tons)
West Bengal	442,000
Bihar	65,000
Maharashtra	45,600
Orissa	33,600
Uttar Pradesh	12,600
Punjab	12,100
Delhi	6,000
Gujerat	6,000
Madras	4,700
Mysore	3,500
Assam	3,000
Kerala	400
TOTAL	635,400

In addition to the above, several grey iron foundries operate in the small-scale sector and are registered with the State Governments. Their number is estimated at 1,200 and the capacity at 6·5 lakhs tons on a very rough basis.

Problems of the industry.—In the initial years of the Second Plan, the production of iron castings was affected by short supplies of pig iron and coke. The position improved with the commissioning of the new steel plants and the Durgapur Coke Oven Plant of the West Bengal Government. The quality of coke has continued to be a problem, particularly in the manufacture of quality castings.

II. Programmes of Development in the Third Plan:

Estimated Demand.—In line with the approach indicated by the National Council of Applied Economic Research, the demand for grey iron castings and steel castings for 1965-66 can be estimated as follows :—

Grey iron castings.—From past trend of consumption in our country, the ratio of grey iron castings to the finished steel comes to 19-20%. Corresponding ratio for U.S.A. in the year 1957 is 19 and that for U.K. in the year 1958 is 22. Taking a ratio of 20, which is considered realistic for projecting the future demand and on the basis of the 6:8 million tons target production of finished steel, the demand for grey iron castings by 1965-66 comes to 13·6 lakh tons.

Steel castings.—From past consumption figures in our country, it is found that 2·5-3·5% of the finished steel is the proportion of the steel castings consumed. The corresponding ratios for the more industrially advanced countries like U.S.S.R., Czechoslovkia and Poland are 4-7%. On the basis of a ratio of 3·5%, which is considered reasonable for India, the requirements of steel castings by 1965-66 come to 2·4 lakh tons.

For steel forgings, based on the trend of increase in the consumption and the likely increased requirements due to greater industralization, the demand for 1965-66 has been estimated by the Development Wing to be 1·8 lakh tons.

Targets.—The following capacity and production targets have been envisaged for 1965-66 :

	(lakh tons)
Steel castings	2
Steel forgings	2
Grey iron castings	12

In view of the importance of these products for machinery industries and for sustaining the growth of other sectors of the economy, the targets should be kept under review at the end of 2 years, in the light of the actual progress made and a clearer picture of the requirements likely to be available as a result of further studies into this industry and related programmes.

Capacity in the public sector.—It has already been indicated that the Heavy Machinery Plant at Ranchi and Coal Mining Machinery Plant at Durgapur under the Heavy Engineering Corporation (HEC) will be commissioned only by about the middle of the Third Plan. The Foundry Forge

plant at Ranchi will be developed in three stages and the capital outlay for the first stage is Rs. 42 crores. The tentative production programme of this plant is given below:

	1st stage (tons)	2nd stage (tons)	3rd stage (tons)
Grey iron castings	25,000	38,300	38,300
Maximum piece weight of above	50	100	100
Steel castings	29,000	56,000	45,000
Maximum piece weight of above	50	60/75	125/165
Steel Forgings	18,500	27,700	69,700
Maximum piece weight of above	30	30	100

The grey iron foundry of the HEC at Hatia is being planned to meet the requirements of the Heavy Machine Tools project in the public sector at the same location estimated at 10,000 tons per year when it is in peak operations.

The Coal Mining Machinery plant at Durgapur planned for an output of 30,000 tons of various coal mining machineries, will have its own foundry and forgeshops of the following capacities :—

	(tons)
Grey iron castings	11,000
Steel castings	6,000
Steel forgings	7,000

Whereas in the initial phase of operation, the requirements of castings and forgings of the machinery projects in the public sector, particularly in the heavier ranges, will be met from the Foundry/Forge Project of the HEC at Ranchi, additional capacity is expected to be developed in conjunction with these demands in due course. A clear picture of these demands is yet to emerge.

The total capacity expected to be created in the public sector on the basis of plans finalised so far is given below:

	Grey iron castings (tons)	Steel castings (tons)	Steel forgings (tons)
	1	2	3
Foundry/Forge project, Ranchi (three stages)	38,000	45,000	69,000
Coal Mining Machinery Plant, Durgapur	11,000	6,000	7,000
Hindustan Machine Tools, Bangalore	6,000	..	..
Steel Plants, Durgapur, Bhilai, Rourkela	75,000	15,000	..
Chittaranjan Locomotive Works	3 000	10,000	..
Heavy Power Equipment Plant (with Czech aid)	21,000	3,000	..

	1	2	3
Heavy Electrical Plant (with Soviet aid) .	2,((	2,2((	..
Others (including foundries attached to railway workshops	6,000	--	--
TOTAL .	158,500	83,200	76,700

Capacity in Private Sector.—38 new units have been licensed for steel castings in the private sector. These units include six units envisaging substantial expansion programmes. The total capacity for these new licensed units will be 1·39 lakh tons.

Licences for the establishment of a capacity of 1·07 lakh tons of steel forgings and 2·40 lakh tons of grey iron castings have also been given so far. State-wise distribution of these licensed capacities as on August 1961 is given below:

State	Steel castings (tons)	Steel forgings (tons)	Grey iron castings (tons)
West Bengal	21,300	39,040	103,880
Maharashtra	26,470	19,315	65,040
Uttar Pradesh	29,400	14,900	41,100
Madras	8,200	14,140	15,832
Punjab	10,320	10,400	58,500
Bihar	5,640	12,000	6,000
Assam	6,000	2,400	..
Andhra	3,000	9,925	..
Delhi	6,000	4,200	90
Kerala	..	..	4,200
Rajasthan	3,600	..	3,600
Madhya Pradesh	6,000	..	96
Orissa	4,800	..	2,520
Mysore	8,400	..	..
TOTAL .	139,130	126,320	301,668

Overall position of capacity.—The overall position of the capacities for castings and forgings on the basis that all licensed schemes would materialise, would be as shown below:

(in lakh tons)

	Public sector	Private sector	Total
Grey iron castings	1·59	9·37	10·96
Steel castings	0·83	1.78	2·61
Steel forgings	0·77	1.69	2.46

It will thus be seen from above that there will hardly be any difficulty in achieving the targets in respect of steel castings and steel forgings. In the case of grey iron castings too, no further licensing of capacity appears to be necessary if the capacities of foundries registered with the State Governments are also taken into reckoning.

Investment.—For ferrous castings and forgings an investment of Rs. 30 crores has been envisaged during the Third Plan Period, in the private sector projects, of which Rs. 15 crores will be the foreign exchange element.

Raw materials and power.—The raw materials involved are pig iron, coke and steel scraps for grey iron and steel castings. Steel ingots and billets are required for steel castings. To achieve the production targets, the following principal raw materials are required:

	(in lakh tons)
Pig iron	15
Coke	3·5
Steel scrap	6
Steel ingots and billets	2

80% of the installed steel foundries in India are equipped with electric furnaces. Taking into consideration the fact that new foundries will mostly be equipped with electric furnaces and taking broadly 800 kwh to be the requirements for melting 1 ton of steel, the electric power requirements for the target production of steel castings comes to 150 million kwh.

Moulding sand.—Ready availability of proper quality of moulding sand, the principal basic moulding material used in the foundries, is essential in promoting growth of the castings industry. For every ton of iron castings one ton of sand is required. Natural river-bed sands are generally good. Green sand moulding is in general use for all types of ordinary grey and malleable castings; dry sand practice is adopted for large high quality engineering castings.

Mechanical Handling.—In semi-mass production and full mass-production work, as is normally the case in the foundry and forge shops, the introduction of proper mechanical handling devices tailored to fit the individual foundry and forge shops, brings about reduction of indirect labour and transportation costs, conserves skilled labour, reduces manual fatigue and increases output. Mechanical handling occupies important place in molten metal handling, sand handling and mould handling in foundry industry and handling of blanks in the forge shops.

Miscellaneous.—Till the newly installed steel foundries are in a position to produce steel castings, the molten metal in the electric furnaces of these foundries can be transformed into ingots and billets, which can be utilised for rolling and forging. This will to some extent improve the existing scarcity of the steel ingots and billets in the country.

The following table summarises the development of the ferrous casting and forging industry during the Third Plan Period (small-scale units have not been included).

		(in lakh tons) 1960-61	1965-66
Grey iron castings	Capacity	6.4	12
	Production	..	12
Steel Castings	Capacity	0.39	2
	Production	0.34	2
Steel forgings	Capacity	0.43	2
	Production	0·35	2

11. STRUCTURAL FABRICATION

Structural fabrication industry, a specialised industry of paramount importance, bridges the gap between the main producer of steel and its consumer. The industry is essentially of a jobbing type and covers a vast range of widely different structurals. Attempt may be made to define the broad limits of the industry in terms of the basic processes undertaken, which include cutting, bending, welding and rivetting, primarily, and casting, forging and machining as subsidiary process.

Structural fabrications find extensive use in various developmental activities though the range and extent of their utilization may vary from one sector to another. Traditionally, the most important fabrications are the general structurals used for all types of residential buildings, factories, power houses, warehouses, offices, shops, schools, hospitals for the conventional constructional uses. For hydroelectric and irrigation schemes, structurals for sluice gates, operating gates and pen stocks are the types broadly used. Among the structural fabrications required by specific sectors of the economy, the important ones are power transmission towers, aerial handling equipments like rope ways, cable ways etc. and structures for roads, railways, river bridges, jetties and docks. Storage vessels consist largely of light and flat work. Vessels for metallurgical and chemical process plants are generally made from heavy and rolled plate work, though there is no clear dividing line between them and the former category. The principal types of the plate and vessel works of metallurgical and chemical processing plants are blast furnaces, steel furnaces, coke ovens, fertiliser plants, sugar plants, cement plants, pulp plants, petroleum refining plants, rayon plants and heavy chemical plants.

In addition to the above, considerable fabrication work is also involved in the manufacture of railway wagons, under frames, coaches, signalling equipments and construction of ships. Programmes of development of railway rolling stock and ship building industries have been dealt under separate heads. Cranes have also been dealt with separately under the head Industrial Machinery.

1. Review of Progress in the Second Plan:

Targets.—With the development of major projects for iron & steel, fertiliser and other heavy chemical factories, heavy electrical plant, refineries, aluminium smelters, cement, paper and sugar mills to mention a few items and wide expansion of activities in the field of railway and other forms of transport, power generation and transmission, multi-purpose and general irrigation programmes and road construction, there have arisen heavy demand for structural fabrications in the Second Plan period. The average demand for steel fabrications inclusive of the demand for wagon manufacture during the Second Plan period was estimated at 450,000 tons per annum by 1960-61 when the Second Plan was formulated. A target of 500,000 tons by 1960-61 for structural fabrications inclusive of the demand for wagon manufacture was accordingly envisaged under the Second Plan.

Capacity.—As against a capacity of 126,000 tons at the end of the First Plan, the installed capacity for structural fabrications expanded to 395,000 tons on a single shift basis by the end of the Second Plan. The Statewise breakup of this capacity is given as under:

States	Installed capacity ('000 tons)
West Bengal	156
Bihar	17
Uttar Pradesh	4
Delhi	7
Orissa	1
Assam	3
Punjab	5
Bombay	154
Rajasthan	16
Madras	14
Kerala	6
Andhra	3
Mysore	9
TOTAL	395

Broad product-wise break-up of the overall capacity is estimated as follows:

Category	Installed capacity ('000 tons)
General structurals	215
Steel bridges	23
Storage vassels	24
Cranes	13
Towers	28
Sluice Gates	4
Large diameter pipes	86
Rolling shutters, doors and windows	2
TOTAL	395

A certain amount of structural fabrication capacity also exists in the public sector in the Railway Workshops, steel plants and in some of the State Governments *e.g.*, Tungabhadra Workshop of the Mysore State and the Nangal Workshop of the Punjab State. In their report on Steel Demand Appraisal, the National Council of Applied Economic Research (NCAER) have estimated this capacity in the public sector at 200,000 tons per year.

Capacity for steel fabrication also exists in the small-scale sector, where fabrication of light general structurals is taken up in a rather disorganised way. As no correct statistics are available, it is rather difficult to project a figure for this sector. Taking into consideration all the above factors and including the capacity for structural fabrication of wagons, the total capacity for structural fabrication industry is estimated at 500,000 tons by 1960-61. It does not fully match with the pattern of requirements and is considered to be deficient in the field of heavy structural fabricational work.

Production.—In spite of large increase in industrial and other construction work involved under the Second Plan and the pressure of demand, the short-fall in production is to be attributed to the shortage of capacity in the heavy structural field and difficulties in regard to steel supplies. The production figures excluding those of the railway wagons are given below:

	Production (in '000 tons)
1956	90
1957	85
1958	113
1959	110
1960	130

Manufacture of wagons involves a large amount of fabrication work. Taking broadly 8 tons to be the structural portion of each 4-wheeler wagon, the production figures for the structural portion of the indigenously manufactured wagons, both in the private and public sector is estimated as follows:

	Production (in '000 tons)
1957-58	143
1958-59	97
1959-60	84
1960-61	95

Thus the total production for 1960 of structural fabrication work including the structural portion of the wagons can be taken to be about 225,000 tons.

Imports.—Fabricated structures were imported as integral part of complete items of equipment and therefore it is difficult to ascertain the exact quantum of import of the structures. The imports were ascribed to the lack of facilities in the country for heavy castings and forgings, absence of design facilities, tendency to negotiate orders abroad for complete equipment, shortage of steel and urgency of the requirements. Exact figures of import are not available.

Investment.—The total investment for the additional 2·7 lakh tons of installed capacity during the Second Plan period can roughly be taken to be Rs. 3·5 crores, of which about Rs. 2·1 crores would have been spent on the plant and machinery element.

II. Programme of Development in the Third Plan:

Estimated Requirements.—The Development Wing of the C. & I. Ministry estimated the total requirements of fabricated structurals (including the requirements of storage vessels but excluding heavy plate and vessel works for all types of chemical and metallurgical equipment) at 9 lakh tons in 1966. On the basis of consumption norms this may be indicated broadly as:

	(lakh tons)
General structures, hydraulic steel works, electric transmission structures and bridges	7·0
Storage vessels, cranes, etc.	1·1
Ancillary structures	1·3 to 0·5
TOTAL	9·4 to 8·6

In relation to the output of about 117,000 railway wagons planned for manufacture in the Third Plan period, the annual average production would work out to 23,000 four-wheelers. The element of structural fabrications under such wagon building programme would have to be placed at about 184,000 tons per year. The overall requirement of structural fabrications would range between 1·0 million to 1·1 million tons in 1965-66 on the basis of the appreciation of the Development Wing and the programme for wagon building.

An alternative assessment was made independently by the NCAER. Based on the normal percentage relationship of fabricated structurals to the rolled steel in the highly industrialised countries of the West, the NCAER took the view that it would be reasonable to assess the future requirements of fabricated structurals at about 15% of the rolled steel demand. On this assumption, the estimate for fabricated structurals would come to 10·2 lakh tons by 1965-66. The following table gives a picture of the breakup of the requirements of structurals for different sectors and industries on the end-use basis according to the forecast of the NCAER.

(in thousand tons)

Sectors	Heavy structurals	Light structurals	Total
1	2	3	4
Transport and Communications including Railways	90	76	166
Large and Medium Industries	292	259	551
Small Scale Industries		30	30

1	2	3	4
Housing and Construction	11	46	57
Power	40	76	116
Irrigation	25	21	46
Agriculture	12	33	45
Others	..	12	12
TOTAL	..	..	1,023

Targets.—The following targets for structural fabrications have been envisaged by the Planning Commission for achievement by 1965-66.

(lakh tons)

Capacity target	11
Production target	10

The above targets are inclusive of wagon builders. Taking into consideration the capacity targets envisaged for wagon building, the share of the other types of fabricational capacity would come to 8·5 lakh tons.

Capacity Licensed and the gap vis-a-vis *the target.*—A number of schemes in the private sector, either by way of substantial expansion of the existing units or as new units have been licensed in accordance with the Industries (Development & Regulation) Act. These will account for additional 1·65 lakh tons of capacity. Further capacity of 1·34 lakh tons has also been cleared for the issue of industrial licences. Thus the total capacity that would be achieved if all the approved projects are implemented, would come to 6·95 lakh tons on single shift basis. The State-wise breakup of this total capacity is given below:

State	No. of firms	Capacity (in '000 tons)
West Bengal	77	253
Bihar	10	33
Uttar Pradesh	9	30
Delhi	4	12
Orissa	4	39
Assam	8	6
Punjab	7	13
Bombay	87	218
Rajasthan	3	28
Madhya Pradesh	3	6
Madras	19	32
Kerala	1	6
Andhra	6	5
Mysore	5	14
TOTAL	243	695

The product-wise breakup of the overall capacity is expected to be as follows:

Category	Capacity (in '000 tons)
General structurals	400
Steel bridges	30
Storage vessels	38
Cranes	21
Towers	68
Sluice Gates	3
Large diameter pipes	130
Rolled shutters, doors and windows	5
TOTAL	695

Developments in the Public Sector.—Heavy Structural Fabrication Works and Plate & Vessel Works.—For the fabrication of heavy welded components of structurals, sections and plates for which the capacity in the country has so far been deficient, a Heavy Structural Works and a Heavy Plate and Vessel Works have been planned for establishment as public sector projects at a combined location in the Nagpur-Wardha area. These two projects are expected to cost Rs. 10·1 crores in all and Rs. 6·4 crores in terms of foreign exchange outlay. The following production programme has tentatively been proposed for these two units:

Heavy Structural Works.—The plant is intended to produce welded plated girders and columns for the heavier type of structures, to fabricate three plate beams into finished girders or columns and heavy conventionally welded and rivetted structures. A capacity of 25,000 tons of heavy structurals on single shift basis has been planned under this unit. Maximum weight of any completed work will be 50 tons and general average weight will be 25 tons.

Heavy Plate and Vessels Works.—The fabrication shops will handle upto 3 inch thick plates, vessels of 15 ft. in diameter and 100 ft. in height and also larger vessels by special arrangements. Items which are proposed to be brought within the production schedule are cylinders, containers, storage tanks, gas producers, combustion chambers, air blowers, purifying towers, gas holders, scrubbing towers, waste heat boilers, heat exchangers, air compressors, absorbers, water pumps, condensers, circulators, gas compressors, convertors, refractory towers and cracking units. Similar equipment for meeting the requirements of steel plants, atomic power stations, oil refineries etc. would also be manufactured. A capacity of about 12,500 tons on single shift basis is planned for development.

Requirements of Additional Capacity.—In relation to the target envisaged for the Third Plan, it does not appear necessary to license further capacity if the schemes licensed for implementation are successfully carried out and the capacity thus available is utilised on the basis of double shift

operation. Consideration may have to be given to the proper balancing of the capacities so as to assist in more effective utilisation of the fabricational facilities that might otherwise be possible.

Investment.—For the structural fabrication industry an overall investment of Rs. 25 crores has been envisaged during the Third Plan, of which Rs. 10 crores is expected to be the foreign exchange element.

Requirements of steel.—Assuming 10% as the process scrap, estimate of steel required for the production target of 10 lakh tons of structural fabrications would come to 11 lakh tons.

Technical know-how.—Structural fabrication is a specialised industry requiring a good amount of design work. Experienced designers and skilled workers are essential pre-requisites for the further expansion of this industry. Need for arranging organised training programme on the part of the major private sector undertakings should be given due emphasis. To create in the country the necessary designing knowledge and technical know-how, major private sector undertakings should establish design cells as part of their units. It is only thus that dependence on foreign firms and know-how can slowly be minimised.

The following table summarises the development of the structural fabrication industry during the Third Plan period.

	1960-61	1965-66
Capacity ('000 tons)	500	1,100
Production ('000 tons)	230	1,000

12. INDUSTRIAL MACHINERY

In Section 4 of the Volume on Programmes of Industrial Development, 1956-61, the industries treated under the broad heading "Industrial Machinery" were cotton textile machinery, jute textile machinery, cement machinery, sugar machinery, paper making machinery, heavy electrical equipment, machine tools and heavy foundries and forges. The picture of the programme for machinery building under the National Industrial Development Corporation (NIDC) and the overall approach thereto have undergone major modifications since 1956. This section does not cover heavy electrical equipment, machine tools and foundries and forges, which have been dealt under separate individual heads. Nevertheless, the general recommendations about technical personnel, design organisations, testing facilities, etc. made under the Second Plan which have been reiterated with reference to this crucial industry in the Report on the Third Plan under paragraph 109 of Chapter XXVI, are equally applicable to all machinery manufacturing programmes in the public and private sectors.

This section is divided into two broad heads. Under the first head, public sector projects like the Heavy Machine Building Plant and the Mining Machinery Plant under the Heavy Engineering Corporation (HEC) have been discussed. Under the second head, private sector industries in respect of the following machinery items have been dealt with :—

(i) Cotton Textile Machinery.

(ii) Jute Mill Machinery.

(iii) Sugar Mill Machinery.

(iv) Cement Machinery.

(v) Paper Making Machinery.

(vi) Dairy Machinery.

(vii) Cranes.

A. Programmes in the Public Sector

The heavy machine building plant is a major industrial complex which is being planned on the model of the huge works established in the USSR for the production of machinery and equipment for the integrated steel plants starting with coke ovens and ending with finishing mills for rolling steel into different categories of end-products. It is physically integrated with the Foundry/Forge plant which would supply the wide range of castings

and forgings for the production of the diverse types of machinery (for details see the section on castings and forgings). The responsibility for the execution of these two projects at Ranchi and of the Mining Machinery plant at Durgapur has been assigned to the Heavy Engineering Corporation (HEC), a Government Company set up at the end of 1958.

Following the 1956 Russian Aid offer of 500 million roubles for the Second Five-year Plan, the Government of India took a decision to go ahead with the Heavy Machine Building plant for producing 45,000 tons of iron and steel plant equipment per year and the Mining Machinery plant with an annual capacity of 30,000 tons of coal mining machinery. The ultimate level of development visualised under the former kept in view as the long-term goal even in the initial stages was an output of 80,000 tons per year which would facilitate an annual rate of expansion of the iron and steel industry by 1·0 million tons and provide some further equipment to meet partially the machinery requirements of the fertilizer and mineral oil industries. Similar long term expansion requirements were also borne in mind in the case of the Mining Machinery plant.

After the receipt from the USSR experts, of the preliminary reports on these two projects, which outlined in broad terms the manufacturing programme and the locations likely to be appropriate for their establishment, Government took decisions in favour of Hatia, 4 miles from Ranchi, for the Heavy Machinery Plant and Durgapur for the Mining Machinery Project. Until the formation of the Heavy Engineering Corporation, the processing of these projects was carried on by the National Industrial Development Corporation.

In connection with the formulation of the Third Five year plan, the future developments under these two projects came up for review in 1959 and Government decided upon the simultaneous execution of work on the 45,000 tons stage and 80,000 tons stage of the Heavy Machine Building plant and the 30,000 tons stage and the 45,000 tons stage of the Mining Machinery plant. This decision was of special significance in the context of the requirements of the iron and steel and coal mining industries in the Fourth Plan period.

The phasing of production under these two projects and the produet mix in the first, and second stages will be as follows:

Heavy Machine Building Plant

(Figures in tons)

Description of items	First stage	Second stage
1	2	3
Coke ovens and bye-product equipment	6,000	7,700
Blast furnace equipment	4,000	5,500
Steel making equipment	5,000	7,000
Crushing & grinding equipment	2,100	3,150

1	2	3
Crane equipment	4,400	6,570
Rolling mill equipment	20,000	34,500
Spare parts for metallurgical equipment	1,500	1,080
Mining equipment	..	880
Excavators	..	4,950
Press forging equipment	..	1,360
Heavy oil drilling rigs	..	5,500
Misc. heavy machine parts & assemblies	2,000	1,810
TOTAL	45,000	80,000

Mining Machinery Plant

(Total weight in metric tons)

Description of items	30,000 tons stage	45,000 tons stage
Coal cutters	1,182	1,715
Loaders	842	1,371
Conveyers	14,991·5	22,500
Trolley & battery type electric mine locomotives	1,300	1,300
Haulages	2,114·6	3,816
Electric winders	466·9	1,167
Main axial fans	821	1,170
Booster fans	20	60
Pumps	754·3	945
Ball mills	324·5	..
Sand pumps	11·7	72
Automatic gauge keps for use in vertical shafts	115·5	..
Safety detaching hooks	..	2,000
Light drill rigs for exploration drilling	..	25
Spare parts	7,055·5	25% of total weight of articles.

Investment & Employment.—The overall fixed investment estimated to have been incurred on the Heavy Machine Building, the Mining Machinery and the Foundry Forge projects in the Second Plan period is Rs. 9·2 crores. Based on the information given in the detailed project reports and its own assessment about the local costs, the Heavy Engineering Corporation made a forecast in the later half of 1960, according to which the capital cost for the full implementation of these projects would be as follows:

(Rs. crores)

Heavy Machine Building Plant—	
1st Stage, 45,000 tons	37·2
2nd Stage, 80,000 tons	48·0
Foundry Forge Plant—	
1st Stage	42·35
2nd Stage corresponding to the 1st Stage of HMB Plant	60·56
3rd Stage corresponding to the 2nd Stage of HMB Plant	72·00
Coal Mining Machinery Plant—	
1st Stage, 30,000 tons	26·00
2nd Stage, 45,000 tons	35·00
Cost Common to the Project at Ranchi—	
Ranchi Township, 1st Stage, 8,000 houses	15·00
Ranchi township, 2nd Stage, 16,000 houses	22·00
Durgapur Township—	
1st Stage, 3,000 houses	5·00
2nd Stage, 5,000 houses	8·00

As against the above estimates of cost and the progress of expenditure in the Second Plan period, the Third Five Year Plan includes a provision of Rs. 119 crores for the execution of these projects. This Plan provision is exclusive of the allocation for townships which is to be found from the lumpsum allocation of Rs. 50 crores made separately under the Third Plan.

As regards employment in the operational phase of these three projects, the requirements of staff and worker (skilled, semi-skilled and ordinary) are visualised at 14,800. To ensure a regular flow of technical personnel, artisans, skilled and semi-skilled workers, so essential for the projects of this type, a comprehensive programme has been worked out on the following line :—

(i) training in USSR and Czechoslovakia.

(ii) training in Corporation's own training institute.

(iii) training in various institutions in India.

(iv) in-plant training in various units of the plants.

Some of the steps taken towards the implementation of each of these projects in the Second Plan period and the development programme in the

Third Plan are outlined below :—

(i) *Heavy Machine Building Plant*

The contract for the preparation of the detailed project was signed in December, 1957. By the end of June, 1959, the report covering the 45,000 tons stage and the 80,000 tons stage of the Heavy Machine Building plant was received from Messrs. Prommashexport, USSR. By the middle of December, 1959, the detailed project report was accepted by the Heavy Engineering Corporation after scrutiny, further discussions with Soviet Experts and approval of Government. The offer for the supply of plant and equipment for the first stage of the project was received in October, 1959 and the contracts in connection therewith were executed in March, 1960.

The offer for the preparation of the detailed working drawings for both the first and second stage was received in January, 1960 and within a month thereafter, the contract for this work was signed with Prommashexport by the H. E. C. The decision to implement both the stages of the project in one step was taken towards the end of April, 1960 by Government. While negotiations with Prommashexport were going as outlined above, the work on land acquisition and civil works at the plant site and township areas were taken in hand by the H. E. C. A tentative time schedule for construction of buildings and erection of plant and equipment was also worked out by H. E. C. in consultation with the Soviet Experts.

As regards the construction programme pertaining to the main production shops under the Heavy Machine Building plant the schedules drawn up by the Heavy Engineering Corporation are indicated below:

Departments	Construction		Equipment erection		Putting Deptt. into operation	
	Commencement	Complete	Commencement	Complete	First phase	Final phase
Reduction Gear Department.	Oct. '61	July '63	Sept. '62	May '64	Oct. '63	June '64
Medium & Small Machinery Deptt.	Nov. '61	Jan. '64	Dec. '62	July '64	Dec. '63	Sept. '64
Blocks of Departments for by-products, Coke Plant & Handling equipment.	Sep. '61	Oct. '63	June '63	Sept. '64	Dec. '63	Dec. '64
Heavy Machine Dept.	Mar. '62	Sept. '64	Oct. '63	Oct. '65	..	Dec. '65

Based on these schedules, the production is envisaged at 5,000/8,000 tons valued at Rs. 2·5/4·0 crores in 1964-65 and 15,000/20,000 tons valued at Rs. 7·5/10·0 crores in 1965-66. In the initial years, the manufacture of simpler items required in the form of independent equipment in the steel plants or in connection with repairs and replacements is proposed to be undertaken. The actual levels of production and the types of products proposed for manufacture will depend mainly upon the orders placed with

the Heavy Machine Building plant by the Hindustan Steel Ltd., and other establishments operating in the field of iron & steel in connection with their expansion/replacement programmes.

(ii) *Mining Machinery Project*

With marginal variations, the action taken by the Heavy Engineering Corporation with the Prommashexport, U.S.S.R. in connection with the implementation of the Mining Machinery project conforms to the time-schedules of the Heavy Machine Building plant. Thus the contract for the supply of plant and equipment required for the 30,000 tons stage of this project was signed in March, 1960 and the revised contract for the preparation of detailed project report and working drawings to cover the expanded capacity of 45,000 tons in December of the same year. The schedule for the implementation of this project in the Third Five-Year Plan, which was under discussion with the Soviet Experts at the end of 1960, with a view to its finalisation is as follows :

Name of Production shop	Commencement of construction	Commencement of erection	Completion of erection	Expected date of initial production
Block No. 3	9/61	7/62	6/64	1/64
Steel Foundry	9/61	6/62	3/64	12/63
Cast Iron Foundry	10/61	8/62	3/64	12/63
Forge Shop	10/61	9/62	3/64	12/63
Fettling Shop	10/61	10/62	3/64	12/63
Block No. 2	10/61	10/62	6/64	2/64
Block No. 1	10/61	10/62	6/64	3/64

In relation to the above schedule, the production of the different items of coal mining machinery plant for 1964-65 and 1965-66 has been envisaged as follows :

Estimated output of coal mining machinery in the Third Plan

Item	Numbers	Weight in tons	Total value (Rs. lakhs)
1964-65			
Pumps	200	400	10·56
Haulages	200	2,000	82·00
Main Axial Fans	50	500	19·65
Booster Fans	100	100	18·00
Conveyors	600	7,000	247·10
TOTAL		10,000	377·31

Item	Number	Weight in tons	Total value (Rs. lakhs)
1965-66			
Pumps	400	800	21·12
Haulages	350	3,500	143·50
Main Axial Fans	100	1,000	39·30
Booster Fans	200	200	36·00
Conveyors	1,200	14,000	494·20
Coal Cutters	20	60	4·78
Coal Loaders	20	120	11·11
Winding Engines	5	200	8·86
TOTAL		19,880	758·87

B. PROGRAMMES IN THE PRIVATE SECTOR

(i) *Cotton Textile Machinery*

The Cotton textile machinery embraces (a) Spinning machinery *viz.*, blow room lines, carding engines, drawing frames, combers, flyer frames, ring frames, etc. (b) Weaving machinery—*viz.* warp winding machines, pirn winding machines, warping machines, sizing machines, looms both plain and auto etc. (c) Processing and Finishing machinery *viz.* Jiggers, printing machines, mercerising machines, bleaching machines, various types of washing machines, polymerising machine, calendering machines, etc.

1. Review of Progress in the Second Plan :

The requirement of major textile machinery during the Second Plan period was assessed at about Rs. 90 crores by value both for modernisation and expansion. During the Second Plan period, the production of textile machinery was of the order of Rs. 42 crores thereby meeting the country's assessed demand by about 46% in terms of value. The table below gives the production of textile machinery since 1955 :—

	(Rs. crores)
1955	5·38
1956	7·30
1957	9·90
1958	7·30
1959	8·10
1960	10·40

During the period 1958-59, the production of major items of textile machinery registered a substantial fall mainly due to the recession in the textile mill industry during that period.

The Textile Machinery Manufacturing Industry made its beginning with the manufacture of ring frames and looms while carding engines and some other items were added later on. A number of new items of textile machinery are being manufactured indigenously *viz.* Blowroom Lines, Draw Frames, Speed Frames, High speed Winding and Warping machines and a number of Wet Processing Machinery which include Winches, Cloth Printing Machines, Agers, Automatic Jiggers, Hot Air Stenters, Mercerising Machines, Singeing Machines, Continuous Dyeing Plant, Pneumatic Mangles, Open Width Bleaching Plant, Polymerising Machines etc. Fresh schemes for the manufacture of new items of machinery with foreign collaboration like automatic looms, sizing machines are now under implementation. Recently, indigenous capacity has also been created to manufacture components of Ring frames like top arm drafting parts, ball bearing top rollers, ball bearing jockey pulleys, roller bearing inserts, etc.

The production trend of major textile machinery (spinning and weaving) during the years 1955 to 1960 along with the licensed capacity for individual manufacturers, is given in Annexure 'A'. It is difficult to indicate the capacity of the processing machinery manufacturers in terms of units as the same capital equipment is utilised for the manufacture of a number of processing machinery according to demand. Annexure 'B' indicates the actual production of spinning and weaving machinery as well as processing machinery during the year 1960.

A survey conducted by an Economic Investigation Team of Small Industries Survey Institute at Bombay and Madras, reveals that by 1956 about 447 small scale units account for an annual output of about Rs. 3 crores worth of spare parts of cotton textile machinery. The spare parts covered in the survey report are under the following broad groups :—

(i) Spinning frames.

(ii) Winding and preparatory equipment parts.

(iii) Loom parts including accessories like dobbies.

(iv) Parts pertaining to finishing and processing machinery.

Region-wise information relating to the number of units and the estimated capacity and the production of these spare parts is given below:

Region	Number of units	Capacity estimated (Rs. crores)	Production estimated (Rs. crores)
Western Region (Bombay, M. P. and Mysore) . .	400	3·93	2·62
Southern Region (Madras, Kerala and Andhra) . .	30	0·33	0·23
Eastern Region (West Bengal, Bihar, Orissa & Assam) .	17	0·28	0·18
Northern Region (Punjab, U. P. and Rajasthan) . .	..	..	..
TOTAL .	447	4·54	3·03

In 1959, the number of units was reported to have increased to 467 with annual installed capacity of Rs. 4·85 crores worth of spare parts. The production in 1959 was estimated at Rs. 4·51 crores. In addition to above, a number of industries having either foundry or machinery shops only, assisted production in this small scale sector. Also about 35-40 textile mills in the Western Region fabricated spare parts in their attached workshops to meet their urgent requirements. Spare parts and components are also manufactured by the textile machinery manufacturing units in addition to complete machines and a few more units which are particularly licensed under Industries (D&R) Act to manufacture such item. These manufacturers together, it is estimated, manufacture spare parts and components worth to the tune of Rs. 6/7 crores in terms of value.

It can, therefore, be said that the total annual production of indigenous textile spares and components of all the three sectors mentioned above would be roughly Rs. 14/15 crores.

Imports.—Figures of import of cotton textile machinery including bobbins, spools and similar articles are given below:

	(Rs. crores)
1957	18·73
1958	10·28
1959	8·96
1960	14·26

Specialised kind of equipment like variable speed motors, oil pressure gear boxes for stepless variations of speeds, PIV types of stepless variation speed units, different kinds of gauges and instruments, special kinds of blowers, pump and suction equipment, various kinds of electric or steam heater etc. manufactured by specialised manufacturers are imported from abroad. Because of the limited requirements and the complexity and intricacy of the machines, indigenous textile machinery manufacturers have not yet taken in hand the manufacture of a few items of machinery equipment. They are—(1) Combers with preparatory (2) Special doublers and cablers (3) Fully automatic winding and warping machines (4) Special types of automatic looms (5) Single spindle automatic Pirn winders (6) Vacuum stripping plant (7) Flat grinding machine (8) Flat milling machine (9) Yarn gassing machine (10) Yarn and fabric testing machines (11) All types of calenders, etc. The demand for the above machines/equipments is generally met by imports.

Exports.—The Engineering Export Promotion Council sent a delegation comprising representatives of engineering industry to African and Middle East Countries to explore the possibility of exporting engineering goods including textile machinery. The visit indicated possibilities for the export of textile machinery to these countries. The industry would make efforts to develop these potentialities.

Price of indigenous equipment.—The prices of textile machinery depend upon specifications and special attachments needed for particular purpose. The prices of the machinery imported from different countries are not the same. The average price of the indigenous machine, however, compares favourably with similar imported articles.

Problems of the Industry—The demand for textile machinery is directly related to the prosperity of the textile mill industry. The production of textile machinery registered a fall in the years 1958 and 1959 mainly due to the recession in the mill industry. Since 1959-60 because of the fairly prosperous period enjoyed by the mill industry, the demand for the textile machinery has been on the higher side. In the year 1960, the machinery manufacturing industry regained its position of 1957. Quite apart from fluctuation of demand, there are other limitations which the machinery manufacturing industry had to face in the past *viz.* (i) difficulties in obtaining imported supplies of capital goods (tools) and components, raw materials, etc. due to limitation in the availability of foreign exchange, (ii) difficulties in securing foreign collaboration for the manufacture of certain textile machinery.

. . . . .

There is scope for standardisation in Textile machinery so that its manufacture on large scale could be undertaken economically. A committee was appointed to indicate the broad specifications of the machinery demanded by the mill industry so that a phased programme of manufacture could be worked out by the textile machinery manufacturers to meet the requirement. This committee has recently finalised its report.

II. Programme of Development in the Third Plan:

Textile machinery will be required (i) for rehabilitation and modernisation and (ii) for new undertaking/expansion of the existing units to be licensed. It may be mentioned that during the Third Plan period it is proposed to license 3 million spindles and 25,000 automatic looms. Licences for a further 1 million spindles may also be granted later. Taking the capacity of the indigenous textile machinery manufacturers into consideration, the target of indigenous production has been envisaged at about Rs. 20 crores annually in terms of value by 1965-66. The corresponding capacity target for 1965-66 has been set at Rs. 22 crores worth of machineries.

. . . . . .

Investment and foreign exchange.—Fixed investment during 1961-66 has been estimated to be Rs. 5 crores of which Rs. 3 crores will be the foreign exchange element.

. . . . . .

Raw materials.—3,500 tons of cast iron and steel will be required for the production target of 1965-66.

(ii) *Jute Mill Machinery*

I. Review of progress in the Second Plan:

Targets.—The production targets for jute mill machinery was placed at Rs. 2·5 crores in terms of value by 1960-61.

Capacity & Production.—During the Second Plan period the capacity for the regular manufacture of jute mill machinery confined to one type of sliver spinning frames and broad looms, besides the occasional manufacture of cop-winders to order. M/s. Britania Engg. Co. Ltd. and M/s. Texmaco Ltd. virtually discontinued production of jute mill machinery before the end of the Second Plan and a new unit, M/s. Oriental Electric & Engg. Co. Ltd., were licensed to manufacture broad looms. Although the schemes for indigenous manufacture of other items of jute mill machinery were being discussed, no capacity for manufacture of these items was actually established during the Second Plan period. The manufacturing capacity as on 31st March, 1961 was as follows :

Item	No. of Mfg. units	Annual capacity (Nos.)	Annual capacity Value (Rs. lakhs)
Light Yarn Sliver Spinning Frames	1	360	180 (on treble shift basis).
Broad Looms	1	144	65 (on double shift basis).

NOTE.—Of the three units engaged in the manufacture of light yarn spinning frames, two having gone out of production, the remaining unit M/s. Lagan Jute Machinery Co., was allowed to work on treble shift basis.

The actual production of jute mill machinery during the Second Plan period was as follows :

	Sliver spinning frames		Broad Looms	
	Nos.	Estimated value (Rs. lakhs)	Nos.	Estimated value (Rs. lakhs)
1956-57	78	37·83	..	..
1957-58	146	70·81	..	..
1958-59	186	90·21	..	..
1959-60	300	145·50	74	32·93
1960-61	279	135·32	87	38·72

During the Second Plan period, a few other units were engaged in the manufacture of spare parts, components & stores required by the jute mills. Some of the units were licensed under the Industries Act and were regularly manufacturing wooden store items like bobbins, shuttles and card clothings, as also steel parts like card pins, gill pins, reeds, cambs etc. Some of these items of stores and spares were also made in small scale sector.

Modernisation of the Jute Industry.—The modernisation of the jute industry during the Second Plan period has been mainly confined to the preparatory and spinning stages upto 31st March 1961, a total of 293,970 modern sliver spinning spindles—248,434 on fine side and 45,536 on coarse side—had been installed and were working in 59 out of 82 mill companies. This means that 84% of the working looms were being fed by sliver spun yarn at the end of the plan period. During the plan period about 989 light yarn spinning frames accounting for 98,900 spindles have been manufactured in the country and no import of light yarn sliver spinning frames was permitted.

The Ministry of Commerce & Industry appointed an Ad hoc Committee in January, 1959 to assess the requirements of modern jute mill machinery and to explore the possibilities of their manufacture in India to the maximum extent possible. The Committee in its report stressed the urgent need to complete the process of modernisation and suggested that the existing units, with large idle capacities, should be asked to take up the manufacture of the main items of machinery required for this purpose.

Employment.—The firms manufacturing jute mill machinery are also manufacturing other items of industrial machinery and as such, workers employed in foundry tool room, maintenance shop etc. are common.

The number of workers employed in this industry as on 31st March, 1961 is about 580.

Imports.—Particulars of import licences recommended/issued for import of jute mill machinery, spares and stores during the plan period are given below:

(Rs. lakhs)

	Jute Mill machinery	Spare parts & stores	Total
1956-57	164	12	176
1957-58	54	41	95
1958-59	227	25	252
1959-60	120	40	160
1960-61	131	40	171

II. Programme of development in the Third Plan:

Estimated requirement.—In the jute textile industry no additional capacity for the Third Plan period is envisaged except the installation of two 150-loom units in Assam. Jute mill machinery will therefore be required mainly for modernisation and rehabilitation of the existing mills. The target for jute goods production for the Third Plan has been set at 13 lakh tons a year. This target can be achieved by progressive unsealing of the

looms not being worked at the close of the Second Plan period. To feed the remaining 16% of the working looms and also looms to be unsealed during the Plan period, the requirement of modern preparatory and spinning machinery for the year 1965-66 estimated on the lines indicated by the Ad hoc Committee, will be as follows:

Machinery	Nos.	Estimated value (Rs. lakhs)
Finisher Cards	10	14·35
Second Drawing Frames	20	8·65
Finisher Drawing Frames	60	23·50
Sliver Spinning Frames	215	109·50
TOTAL		156·00

As for the post-spinning machinery it is difficult to assess at this stage the exact annual requirement, but it may be estimated to be within Rs. 100 lakhs.

Targets.—On the basis of the above estimated requirement the capacity and production targets for jute mill machinery in the Third Plan can be placed at Rs. 2·50 crores per annum.

Further modernisation and additional manufacturing capacity.—In the Third Plan the Indian Jute Industry is expected to take up the modernisation of its equipment for the post-spinning stages. Old winding equipment is expected to be largely replaced by new high-speed machines, and additional pre-beaming equipment will be installed to incerase productive efficiency. For the modernisation of the weaving process, the choice would be between (a) rendering the existing flat-bed looms semi-automatic by the use of cop-changers and warp-stop-motions. (b) replacement by automatic circular looms, and (c) replacement by automatic shuttleless looms. The leading mill-group have for some time now been experimenting with these three methods of loom-automatisation, and by early 1962 are expected to be in a position to draw up their modernisation programmes. The phasing of the programme, will depend on the availability of foreign exchange, the indigenous output of modern jute mill machinery and the probable impact of loom automatisation on employment.

Besides fine-yarn spinning frames, broad looms and copwinders, whose production is now well-established, the plans for the indigenous production of a number of other machines has been finalised. These include coarse-yarn spinning frames, drawing frames, cone-winders, pre-beamers, cop loaders and shuttleless looms. Virtually the whole range of machines needed by the Jute industry for modernisation is thus expected to be available from indigenous sources by the middle of the Third Plan. The output of spares and stores for the industry will also be stepped up.

Taking into account the new licences issued under the Industries Act and the additional capacity being established in the country, the following table gives the position of expected manufacturing programme during the Third Plan period :

Name of the products	Annual capacity on single shift basis	Value of the products
	Nos.	(Rs. lakhs)
Preparatory & spinning		
Light yarn spinning Frames	120	61·20
Heavy Yarn Spinning Frames	48	28·80
First Drawing Frames	24	7·08
Second Drawing Frames (Light Yarn)	24	9·96
Finisher Drawing Frames (Light Yarn)	48	19·78
Finisher Drawing Frames (Heavy Yarn)	24	9·20
Post-spinning		
Broad Looms	72	31·02
Cone Winders	48	18·44
Pre-beamers	24	20·64
Dressing Machines	12	25·68
Automatic Loom ('One nack')	360	43·20
	TOTAL	270·00

(iii) *Sugar Mill Machinery*

I. Review of progress in the Second Plan:

Targets.—The Second Five Year Plan laid down a provisional production target of Rs. 2·5 crores worth of sugar mill machinery for 1960-61. This was the equivalent of five sugar plants of 1,000 tons per day crushing capacity which are expected to be required annually on replacement account after 1960-61.

Capacity.—The urgency of accelerating the developments under sugar mill machinery manufacture came to limelight when it was found difficult, in the wake of the foreign exchange crisis of 1957, to provide for the import of sugar mill machinery and Government took the decision to regulate the future growth of the sugar industry in step with the indigenous availability of plant equipment. Under the impetus of demand for indigenous plant and equipment generated by this major policy decision and the assistance

provided by Government in various ways e.g., release of foreign exchange for capital goods and imported components, standardisation of mill capacity for new sugar plants and facilitating the formation of consortiums, the sugar mill machinery manufacturing industry made rapid progress. At the end of the Second Plan the following firms were in a position to fabricate equipment for sugar mills.

Firm	Machinery under production	Capacity (Rs. crores)
M/s. Walchandnagar Industries, Poona .	2 complete plants ; gears and general items.	3·6
M/s. K. C. P. Ltd., Madras . . .	2 complete plants . . .	1·6
M/s. Binny's Engineering Works, Madras	2 complete plants except centrifugals.	1·6
M/s. New Indian Development Corporation, Pimpri.	2 complete plants including centrifugals.	1·6
M/s. Indian Sugar & General Engg. Co., Ambala.	2 complete plants except centrifugals.	1·6
M/s. Texmaco, Belgharia . . .	2 complete plants except centrifugals.	1·6
	TOTAL .	11·6

In addition to the above, 17 firms were in a position to undertake manufacture of general items, vaccum pans, evaporators, centrifugals, castings, and structural items required for the sugar machinery. Their aggregate capacity comes to Rs. 2·8 crores. The total installed capacity at present thus comes to Rs. 14.4 crores worth of sugar mill machinery.

Production.—The production of sugar mill machinery is given below year-wise.

	(Rs. crores)
1956	0·3
1957	1·6
1958	2·0
1959	2·8
1960	4·2

Import.—The imports of sugar manufacturing and refining machinery, as given in the Monthly statistices of Foreign trade of India were given as follows :

	(Rs. crores).
1957	3·9
1958	7·3
1959	2·3
1960	0·8

The main components which were allowed to be imported in connection with the first batch of orders for the manufacture of complete sugar machinery plants undertaken in 1960 were boilers, turbo alternators, air compressors of higher ranges, motors of 300 H. P. and above, heavy castings, centrifugal components, brass tubes and reduction gear units.

Consortiums.—The six major sugar mill machinery manufacturers who are fabricating machinery in collaboration with foreign parties have formed themselves into two consortiums for the purpose of fabricating and supplying complete sugar mill plants.

II. Programme of development in the Third Plan:

Estimated requirements.—The installed capacity of sugar industry by the end of the Second Plan is 2·25 million tons and the target for 1965-66 has been envisaged to be 3·5 million tons. To secure the required increase of 1·25 million tons in sugar capacity, 95 sugar plants of daily crushing capacity of 1,000 tons are required. Taking into consideration that 10% of these plants are already with the new factories in the process of being installed, the net requirement is 85 sugar plants which corresponds to Rs. 68 crores worth of machinery. This estimate is exclusive of the replacement and modernisation demand under this industry which is quite sizeable on account of the backlog still outstanding. The magnitude of replacement demand is under study with a view to assessing it on a realistic basis. In a sense, therefore, these estimates of demand covering primarily the requirements of new capacity to be built in the Third Plan are provisional. The requirements of new capacity have also come up for review as a result of the high level of production recorded in 1960 with the capacity then available.

Targets.—Against the background of the various considerations discussed above, the production target for sugar mill machinery in 1965-66 has been envisaged at Rs. 14 crores and the corresponding capacity at Rs. 15 to 16 crores. This will be equivalent to 17 complete sugar plants of 1,000 tons/day crushing capacity and their indigenous content would be about 85%.

Capacity licensed and under implementation.—A licence has been given in 1960 to M/s. Triveni Engineering Works, Allahabad for undertaking the manufacture of milling plant, mill gears, centrifugals, engines and turbines for milling drive and power generation. The firm will have technical collaboration with M/s. Booker's Engineering Ltd., London and will manufacture sugar machinery worth Rs. 1·5 crores. With the implementation of this project, the capacity is expected to be more or less in balance with the target envisaged.

Raw materials.—The principal raw materials required for the production target of 1965-66 are given in the following table:

Steel	20,000 tons
Special steel	2,000 tons
Non-ferrous metals	800 tons
Fire bricks	1,100 tons

(iv) *Cement Machinery*

I. Review of Progress in the Second Plan:

Targets.—A target of 16 million tons capacity for the cement industry was envisaged by the final year of the Second Plan. The value of machinery (excluding electrical items), taken at about 50% of the fixed investment of Rs. 82 crores for achieving the target would come to about Rs. 40 crores for the whole plan period. Taking a uniform rate of expansion, the annual requirement of the machinery was placed at Rs. 8 crores.

In relation to the annual requirements on account of replacement from 1960-61 onwards estimated in terms of four cement plants of 500 tons daily capacity each, a provisional target for cement machinery worth Rs. 2 crores had been set for the Second Plan. The advantages of stepping up the investment and output in this field have been stressed and in connection therewith reference was made to the cement machinery project of M/s. Associated Cement Companies under consideration.

Capacity and Production.—At the beginning of Second Plan there was no unit in the country for producing complete cement plant machinery, though 4 establishments attached to cement works were turning out selected items of plant equipment of relatively minor importance. The indigenous production in the last five years of such items of cement machinery and spare parts, which also include an important item, clinker cooler, is as shown below :

	Number of units in operation	Value of output (Rs. lakhs)
1955	4	34
1956	4	42
1957	5	62
1958	5	64
1959	6	64
1960	6	63

The installed capacity in 1960 was equal to Rs. 110 lakhs worth of cement machinery per year on double shift basis, the unit-wise break-up being as given below:

Firm	Annual capacity (Rs. lakhs)
M/s. A.C.C. Shahabad	90
M/s. K. C. P. Ltd., Madras	5
M/s. Rohtas, Dehri-on-Sone	5
M/s. Orrissa Cement, Orissa	5
M/s. Dalmia Dadri, Punjab	5
TOTAL	110

The machinery requirements for expanding the capacity of the cement industry during 1956-61 were almost entirely met through imports. Plans for fostering the capacity for the manufacture of cement machinery were initiated only in the later years of the Second Plan with the result that the schemes under implementation are yet in the construction phase and the production target set for the Second Plan has remained unfulfilled. The actual investment made for establishing new capacity for cement machinery since 1959 is estimated to have been about Rs. 80 lakhs by the close of the Second Plan.

II. Programmes of Development in the Third Plan:

The projections of future demand to be borne in mind in visualising the Third Plan target for cement machinery have to take into account the overall requirements of cement machinery inclusive of the replacement demand in the Third Plan period and also the likely average rate of annual growth of the cement industry in the subsequent plan period. Based on the capacity for cement production installed by 1960-61 and the target for the Third Plan, the expansion of the cement industry would call for the building up of an additional capacity of 6 million tons over the five-year period. The capacity due for replacement under the cement industry is reckoned at 1·5 million tons representing the plants in existence before the Second World War i.e. about 20 to 25 years ago. Of this total capacity, the share of M/s. Associated Cement Companies is placed at 1 million tons which would be taken care of under its programmes of modernisation and expansion in the Third Plan period. On this basis, the replacement demand in the Third Plan period has been placed at 0·5 million tons of cement making capacity.

The overall demand for cement machinery on account of new capacity to be built and the replacement programmes to be carried out in the Third Plan period thus comes to 6·5 million tons. If this overall programme is phased uniformly over the Third Plan period, the annual demand for cement machinery would be related to 1·3 million tons in terms of cement which will be equal to 6½ plants of 600 tons daily capacity each. The growth of the cement industry under the Fourth Plan visualises an addition of 10 million tons of installed capacity over the five-year period. Assuming a progressive rise in the rate of expansion of growth, it is envisaged that as against about 1·5 million tons per year in the initial years, the annual build-up of capacity might rise to 2·5 million tons in 1970-71. Even assuming that the cement machinery manufacture might expand in the Fourth Plan period in step with the rise in demand for plant and equipment, it is important that the capacity available at the end of the Third Plan should be adequate to take care of the requirements of cement machinery in 1966-67.

Under both the assessments discussed above, it is necessary to make some allowance for the impact of the slag cement manufacture for which the machinery requirements are comparatively of a smaller magnitude.

On balance of all considerations, it is felt that the requirements of cement machinery should be visualised in terms of 6 to 7 plants for 500-600 tons daily capacity each in 1965-66. This assessment of demand may need

re-examination with a view to stepping up the capacity and output if as a result of delay in the installation of cement plants in initial years, the additional capacity to be built in the later years of the Third Plan would turn out to be larger than envisaged now on the basis of a uniform rate of expansion over the quinquennium.

Targets.—The expansion of capacity for cement mill machinery should provide for meeting the estimated requirements in full from indigenous sources as well as achieving an indigenous content of 90 per cent by 1965-66. In this context, standardization of plant equipment should receive early attention. Further, in view of the saving in fuel consumption that would be secured through the adoption of the dry process, the feasibility of adopting this process in locations far removed from the centres of coal production should be fully explored.

Schemes under implementation.—M/s. ACC-Vickers-Babcock (AVB) cement machinery project under implementation at Durgapur have been licensed to produce the following items :

(1) Excavating and drilling equipment.

(2) Rolling stock (B. G. tipping wagon of 350 c. ft. and 200 c. ft.).

(3) Crushing plant.

(4) Grinding mills.

(5) Rotary kilns and clinker coolers.

(6) Conveying and transport equipment.

(7) Dust collecting equipment.

(8) Thickners, slurry mixtures, fans, blowers etc.

(9) Cranes, especially grab cranes.

(10) Reduction gear boxes and miscellaneous equipment.

To support the manufacturing activities of this project, the workshops of M/s. Associated Cement Companies Ltd. at Shahabad have also been undergoing substantial expansion. The yearly availibility of complete cement making plants from the AVB Organisation is expected to be 4 plants of 500 tons per day capacity each, from the beginning of 1962. The annual licensed capacity of the AVB project at Durgapur and the Shahabad workshops are placed at Rs. 600 lakhs in terms of the value of equipment that would be manufactured.

Messrs. K. C. P. Ltd. Madras, have been licensed to undertake the manufacture of complete cement plants at Tiruvottiyur (Madras) in collaboration with Messrs. Fives Cail Ltd. of France. The approved capacity of this firm for cement machinery is 2 plants per annum and this is equivalent to about Rs. 150 lakhs.

License has also been given to M/s. Sahu Jain to undertake the manufacture of 2 plants per annum. This firm will be in collaboration with M/s. F. L. Smidth and is expected to commence production from 1964 onwards.

Messrs. Orissa Cement, Rajgangpur, Messrs. Dalmia Cement Ltd., Dalmiapuram (Madras) and M/s. Rohtas Industries, Dalmianagar (Bihar) have also got a combined installed capacity of Rs. 15 lakhs worth of general items of cement machinery.

The implementation of these schemes will facilitate the achievement of the target proposed for the Third Plan. A continuous and intimate study of several factors such as speedy implementation of the schemes licensed, timely arrangements for procurement of bought-out items in the country as well as imported components, training of personnel and understanding in regard to performance guarantees between the enterpreneurs engaged in expanding the capacity for cement production and the machinery manufacturers is essential for the execution of the programmes successfully and in time.

Fixed Investment and Raw Materials.—It is difficult to forecast the investment requirements with accuracy particularly in view of the fact that multi-purpose use of the shop facilities for the manufacture of other capital goods is also projected under some of these establishments which are visualised as composite undertakings. There is also the practice of entrusting the production of some of the components to ancillaries or even major establishments with surplus capacity. Subject to the influence of these considerations on the projections of capital cost, the requirements of investment for the cement machinery manufacture are placed at Rs. 3 crores overall and Rs. 2 crores in terms of foreign exchange *vis-a-vis* the targets set under the development programme. These investment figures are inclusive of investments of minor nature in the sugar mill machinery industry.

The major items to be procured from external sources for cement machinery manufacture would be : electric motors of 250 to 800 HP, grey iron castings, control instruments and reduction gear boxes in the case of some parties. Grinding media would also figure among bought-out items. Until the control instruments, heavy electrical motors and heavy castings are available from indigenous sources (for this purpose plants are under establishment in the public sector e.g., Heavy Electrical Equipment project and the precision Instruments projects) the demand for these items on account of cement machinery manufacture would have to be met through imports. The achievement of indigenous content of 90 per cent set as the target for 1965-66 would require timely development of production facilities for these items before the end of the Third Plan. The requirements of steel *vis-a-vis* the production target for cement machinery are estimated at 16,000 tons out of which 70 per cent would be in the form of flats and sheets, 20 per cent in the form of structurals and 10 per cent in the form of bars and rods.

(v) *Paper Making Machinery*

1. Review of progress in the Second Plan :

Targets.—On the basis that the entire range of machinery for a paper mill of 50 tons daily capacity would be manufactured in the country, a target of Rs. 4·0 crores worth of paper making machinery was set for the Second Plan.

Capacity and Production.—Till recently, paper making plants were not manufactured in the country and there were only two firms producing some items of spares on a jobbing basis. Prior to 1960, production of paper making machinery was practically negligible. Production in 1960 which has been estimated at Rs. 0·9 lakh points to a major shortfall *vis-a-vis* the target. Capacity for paper mill machinery was however developed by the end of the Second Plan through the implementation of the following schemes in varying stages:

Firm	Type of Machinery	Annual capacity (Rs. lakhs)
M/s. Telco Jameshedpur . . .	Large plants of capacity 50 tons/day	195
M/s. Paper Mill plant & Machinery Mfgrs., Bombay.	Small and medium plants of capacity 10 to 3 tons/day	50
M/s. Rohtas Industries Ltd., Dalmianagar.	Do. . . .	40
M/s. Paper & Pulp Conversions Ltd., Poona.	Do. .	16
M/s. Eastern Paper Mills Ltd., Calcutta .	Small plant of 2 tons capacity & Board Mill plant . .	15
M/s. Garlick & Co. Ltd., Bombay .	Accessories and components .	39·4
M/s. Port Engg. Works Ltd., Calcutta .	Do. . . .	10
M/s. Dynacraft Machine Co., Bombay .	Do. . . .	1
M/s. Berry Brothers, Sukchar (W. Bengal)	Do. . . .	4
	TOTAL .	370·4

Imports.—Imports of paper mill and pulp mill machinery in the Second Plan period were as follows between 1957 and 1960:

	(Rs. crores)
1957	4·76
1958	3·72
1959	2·69
1960	2·64

II. Programme of development in the Third Plan:

Estimated demand and targets for paper mill machinery.—The installed capacity of the paper industry which stood at 410,000 tons at the start of the Third Plan is expected to be raised to 820,000 tons by 1965-66. This increase will be secured mostly through the installation of paper plants of 50 tons and 10 tons daily capacity and multiples thereof. The average rate

of expansion of capacity would be about 80,000 to 85,000 tons of paper per year. The expansion of capacity of the paper industry can be continued on this scale on the basis of the targets for paper mill machinery production proposed, namely, four plants of 50 tons daily capacity and four plants of 10 tons daily capacity.

The expansion of the paper industry during 1966-71 would be much faster. Planning may therefore have to be on the basis of units of 100 tons capacity per day as against the standard size of 50 tons per day adopted as the mainstay of the growth of the paper industry in the current plan period. To provide for the demands in respect of such bigger plants as well as of newsprint mills and chemical pulp plants that would have to be installed in the next plan period, plans would have to be formulated well in time before the end of the Third Plan.

The targets firmly included in the Third Plan for paper mill machinery are summarised below:

Plant	Standard size (tons per day)	Number of plants	Value of plants excluding electrical, steam raising & allied equipts. (Rs. crores)	Indigenous content (per cent)
Large plant	50	4	6·5 to 7·0	70
Small plant	10	4		

Schemes under implementation and schedules or production.—The target for the Third Plan is expected to be achieved by a judicious phasing of the following schemes cleared for implementation during the Third Plan period under the Industries (Development and Regulation) Act.

Firm	Type of machinery	Collaborator	Annual capacity (Rs. lakhs)
M/s.A.C.C. Ltd., Shahabad	Large plant of capacity 50 tons/day.	Against designs of Tata-Johnson.	80
M/s. Bertram Scott Ltd., Titagarh.	Do.	Earnest Scott & Co., Scotland; James Bertram Sons, England; Bertrams Ltd., England	269
M/s. Utkal Machinery, Ltd., Rourkela.	Do.	J. M. Voith, West Germany	100
M/s. Shalimar Industries Ltd., Howrah.	Accessories & components.	Norak Gjaerdeogmetaduk, Norway	20
M/s. Bharat Machine Wire Co., Chandigarh.	Do.	..	35
M/s. Jagdish Lal & Bros., Chandigarh.	Do.	..	12·2
		TOTAL	516·2

The Tata Johnson unit (Telco in collaboration with M/s. A Johnson & companies of Sweden) is expected to be in a position to deliver 2½ plants of 50 tons per day capacity by the end of 1962. Each of the firms, M/s. Utkal Machinery Manufacturing Co. and M/s. Bertram Scott. Ltd. have planned to be ready to supply one plant of 50 tons per day capacity by about the same time. In other words, from the beginning of 1963, it would be possible to arrange for supplies of 4½ plants per annum of 50 tons per day capacity from indigenous sources.

As regards the smaller plants M/s. Rohtas and M/s. Paper Pulp Conversion have each already produced a small scale plant. M/s. Paper Mill Plant & Machinery manufacturers and M/s. Eastern Paper Mills have also supplied one 5 tons paper mill plant and five Board Mill plants respectively. Subject to the booking of firm orders in time, the following deliveries are stated to be feasible from the end of March, 1961 :

M/s. Rohtas . .	2 paper plants of 3 tons capacity and 2 paper plants of 5 tons capacity each.
M/s. Paper Pulp Conversion	2 plants of 3 tons capacity each and one plant of 5 tons capacity.
M/s. Paper Mill Plant & Machinery Manufacturers.	5 plants of 5 tons capacity each and 2 plants of 10 tons capacity each.

Investment and foreign exchange.—During the Third Plan period, the fixed investment for the creation of the installed capacity as targetted has been estimated at Rs. 7 crores of which Rs. 4 crores will be in foreign exchange element.

(vi) *Dairy Machinery*

1. Review of progress in the Second Plan :

No specific targets were proposed for dairy machinery at the time of the formulation of the Second Plan. To provide the background for planning in this field and assist the consideration of applications from private enterprise for establishment of capacity for dairy machinery manufacture, the Development Wing assessed the level of demand by 1961 at Rs. 1·5 crores in terms of value.

During the later part of the Second Plan period 2 units—M/s. A. P. V. Engineering Company, Dum Dum and M/s. Larsen and Toubro Ltd., Bombay—with a combined capacity of Rs. 30 lakhs worth of machinery output per year on double shift basis, started manufacturing dairy equipment. The production of these units in 1960 was valued at Rs. 18 lakhs. The import

of milking machines, cream separators, churners, butter and cheese making machines and other dairy farm equipment, as given in 'Monthly Statistics of Foreign trade of India' was as follows between 1957 and 1960 :

	(Rs. lakhs)
1957	9
1958	11
1959	40
1960	28

II. Programme of Development in Third Plan :

Based on an assessment made by the Ministry of Food and Agriculture, the requirements of dairy machinery have been placed at Rs. 2·5 crores per year during the Third Plan period. The dairy development in the Third Plan provides the background for these projections of demand. The targets of annual capacity and production during the Third Plan period have accordingly been fixed at Rs. 2·5 crores worth of dairy machinery with the objective of achieving self-sufficiency.

Licences for manufacturing dairy equipment have been given to the following firms in accordance with the Industries (Development and Regulations) Act:

Firm	New Unit/Substantial Expansion	Collaborator	Capacity (Rs. lakhs)
M/s. Larsen and Toubro Ltd., Powai, Maharashtra.	Substantial Expansion.	(*i*) M/s. Silkeborg, Machine-fabrick, Denmark for H. T. S. T. Plate Pasteuriser	100
		(*ii*) M/s. Wright Hargeaves. Engineering Co., U. K. for rotary automatic and washer. . . .	
		(*iii*) M/s. U. D. Engg. Co. UP for bottle fillers and washers.	
		(*iv*) M/s. Niro Atomiser, Denmark for spray drying plant.	
M/s. A. P. V. Engineering Co., Dum Dum.	Substantial Expansion.	M/s. A.P.V. Co., U.K. .	23
M/s. Vulcan Trading Co., Bombay.	New Unit .	M/s. Grahum Enock Manufacturing Co., London .	26
M/s. Alfa Lavel Ltd., Bombay.	New Unit .	M/s. A. B. Separator, Sweden.	140
		TOTAL .	289

In relation to the target set for the Third Plan, further licensing in this field is not called for. It is, however, important for the smooth implementation of dairy development programmes that the schemes licensed are implemented expeditiously.

The total investment during the Third Plan period for the dairy machinery industry has been estimated to be Rs. 50 lakhs.

(vii) *Cranes*

Overhead travelling cranes for industrial concerns, Gantry cranes for dockyards and rotary cranes like derricks, pillar cranes, jib cranes, mobile cranes have figured as major items of import under the Second Plan with its emphasis on industrialisation, and modernisation of ports and harbours and methods of handling of different bulk materials. Manufacturing of cranes is basically a structural work. It is therefore an extension of activity on the part of heavy and medium structural fabrication shops. Due to this factor it is somewhat difficult to get precise figures of production potential of the industry.

1. Review of Progress in the Second Plan:

Fifty years ago one firm in Calcutta—M/s. Jessop & Co. took up crane manufacture of their own design. This is only of historical interest since production of cranes was negligible till about a decade ago.

No development programme for this industry was formulated in 1956. A demand figure of 22,300 tons for 1961, as estimated by the Development Wing, was broadly taken as the basis for regulating the expansion of this industry during the Second Plan period.

Capacity and Production.—Capacity of about 1,000 tons was developed in the Second Plan period. The present installed capacity on double shift basis is given below:

Firm	Annual Capacity (tons)
M/s. Jessop & Co., Calcutta	2,000
M/s. Burn & Co., Howrah	1,500
M/s. Textile Machinery Corporation Ltd., Belghuria	3,600
M/s. Garden Reach Workshop Ltd., Calcutta	400
M/s. Richardson & Cruddas Ltd., Bombay	100
M/s. Western Mechanical Industries Ltd., Bombay	300
M/s. Brady Engineering Co., Bombay	300
M/s. Garlick & Co., Bombay	100
TOTAL	8,300

These firms are known to manufacture the following types of cranes :—

E. O. T. Cranes 3-40 tons capacity.

Wharf cranes for Port Trust.

Goliath cranes.

Jib cranes.

Hand operated cranes.

The production figures since 1957 are given below:

	(in tons)
1957	507
1958	491
1959	1,120
1960	1,600

Imports.—The import figures of power cranes, as recorded in the 'Monthly Statistics of Foreign trade of India' are as follows:

	(Rs. crores)
1957	5·28
1958	4·23
1959	5·25
1960	3·78

In some major cases cranes are imported as integral part of the machinery and these are not reflected in the above figures. Taking into account this factor the total import of cranes during 1960 is believed to be about Rs. 7 crores.

II. Programme of Development in the Third Plan:

Targets.—From a rough comparison of the levels of investment under metallurgical and engineering industries, and broad estimates of expansion levels for ports, harbours and railway works, it has been felt that the demand for cranes would go up to 60,000 tons by 1965-66.

A capacity and production target of 60,000 tons per annum has been envisaged for this industry for 1965-66. This corresponds to about Rs. 22 crores worth of crane equipment.

Cranes required for heavy electrical plants and Bokaro Steel Plant.—It has been estimated that for Heavy Electricals Ltd., Bhopal (for an annual production target of Rs. 50 crores) and for the other two heavy electrical

plants to be built with Czech and Soviet assistance, 344 numbers cranes of capacity varying from 3 tons to 150 tons and worth Rs. 5 crores will be required. For the integrated Bokaro Steel Project with an output of 2 million tons of steel ingots and with facilities for the production of different types of flat products, 123 numbers cranes of capacity varying from 5 tons to 300 tons and worth Rs. 2·8 crores will be the requirement. The above requirements amounting to a total of Rs. 7·8 crores or 20,000 tons of crane equipment will arise in the Third Plan period from only these four projects.

Schemes under implementation.—Annual capacity to the tune of 12,000 tons on double shift basis has already been licensed under the Industries (Development and Regulations) Act in favour of about 8 concerns, which are yet to go into production. The following types of cranes are covered in the licences :—

E. O. T. Cranes 3-100 tons capacity.

Dock side cranes.

Slewing/Leeffing cranes.

Cranes for steel works.

Most common sizes of mobile cranes that are in demand in India are 50, 30 and 20 tons capacity. Licences to the following two firms for manufacture of mobile cranes upto 10 tons capacity have been given :

M/s. K. T. Steel Works Ltd., Bombay.

M/s. Tractor India Ltd., Calcutta.

Capacity in the Public Sector.—Heavier types of cranes are proposed to be taken up for manufacture in the public sector. The Heavy Machine Building project under the Heavy Engineering Corporation will take up the manufacture of crane equipment and the following production schedules have been drawn up for it:

First stage	4,400 tons of crane equipment.
Second stage	6,570 tons of crane equipment.

The heavy structural shop, to be set up with U. K. collaboration will also undertake the building of crane equipment. The detailed plans for this project are yet to be worked out.

Additional capacity required.—A gap to the tune of 20,000 tons is yet to be filled up during the Third Plan period by creating more capacity for crane manufacture. The existing units, already in line, can be encouraged to expand their activity. There are at present about 150 steel structural fabricators in the private sector, who can with advantage take up crane manufacture to utilise their idle capacity. A minimum economic unit for crane manufacture is visualised at 1,000 tons per annum involving an overall investment of about Rs. 25 lakhs. Independent units of economic production range can also be encouraged to come up in the private sector.

Requirements of steel.—The target of 60,000 tons is related to the weight of the steel structural portion of the crane equipment. For the production of 60,000 tons of crane equipment about 62,000 tons of steel are required.

Bought out items.—The principal bought out items for this industry are steel wire ropes and electrical items like electric motors, controllers, limit switches and magnetic brakes. Wire ropes are at present mainly imported, but arrangements for their indigenous manufacture have been made and discussed under a separate head in this volume. The electrical items required are of a specialised nature. Licences to undertake the manufacture of some of these items have also been given to a few concerns and several of these items would also be indigenous.

Design facilities.—Crane manufacture is an industry of specialised nature. It is desirable for large manufacturers to develop design organisations of their own for evolving different types of cranes for which there may be need.

The following table summarises the development of the crane industry envisaged during the Third Plan. The capacity figures are given on two shift basis:

	1960-61	1965-66
Annual capacity (tons)	8,300	60,000
Annual production (tons)	1,600	60,000

ANNEXURE A

Production Trend of Major Cotton Textile Machinery (Spinning and Weaving) Manufactured Indigenously

Item	Name of the firm	Annual licensed capacity	Production during the year						
			1954	1955	1956	1957	1958	1959	1960
1	2	3	4	5	6	7	8	9	10
Blow-room lines.	M/s New Standard Engg., Bombay	24	..	..	..	..	..	..	..
	M/s Ramakrishna Industries, Coimbatore . .	12	..	..	..	..	..	..	..
	TOTAL .	36	..	..	..	..	..	..	..
Carding Engines.	M/s Machinery Manufacturers Corporation, Calcutta . .	1200	424	559	546	638	477	263	685
	M/s Textool, Coimbatore . .	300	48	90	180	262	207	130	110
	M/s Texmaco, Calcutta . .	300	..	..	..	50	103	133	55
	M/s N.M.M., Bombay	600	..	..	..	73	361	237	223
	TOTAL .	2,400	472	649	726	1,023	1,148	763	1,073
Draw Frames.	M/s Textool, Coimbatore . .	96	8	44	24	34	9	40	47
	M/s Texmaco, Calcutta . .	84	..	..	..	..	..	..	..
	M/s Ramakrishna Industries, Coimbatore . .	48	..	..	..	..	..	..	..
	M/s Lakhmiratan Engg., Kanpur . .	36	..	..	..	..	..	..	..
	M/s N.M.M., Bombay	60	..	..	..	..	..	..	..
	TOTAL .	324	8	44	24	34	9	40	47
Speed Frames.	M/s Textool, Coimbatore . .	96	6	28	29	33	28	21	45
	M/s Lakhmiratan Engg., Kanpur .	72	..	..	..	..	..	..	..

ANNEXURE A—*Contd.*

1	2	3	4	5	6	7	8	9	10
	M/s Texmaco, Calcutta . .	168	..	..	..	..	..	..	..
	M/s Ramakrishna, Coimbatore . .	72	..	..	..	..	..	..	..
	M/s N.M.M., Bombay	60	..	..	..	..	..	..	..
	M/s M.M.C., Calcutta	90	..	..	..	..	..	..	..
	TOTAL .	564	6	28	29	33	28	21	45
Ring Frames.	M/s Textool, Coimbatore . . .	600	88	228	266	338	285	333	313
	M/s Texmaco, Calcutta . .	600	146	384	472	507	269	370	378
	M/s N.M.M., Bombay	900	124	237	337	476	269	371	408
	M/s Ramakrishna, Coimbatore . .	276	..	14	35	43	54	3	28
	M/s Lakshmiratan, Kanpur .	300	..	..	..	..	..	..	..
	TOTAL .	2,676	358	863	1,110	1,364	877	1,077	1,127
Winding m/c.	M/s CIMMCO, Gwalior . . .	60	..	..	..	2	..	..	25
	M/s Textool, Coimbatore . . .	120	..	..	..	..	..	..	..
	TOTAL .	180	..	..	..	2	..	..	25
Warping m/c.	M/s CIMMCO, Gwalior . .	60	..	..	..	1	..	..	3
Looms (Plain)	M/s Cooper Eng., Satara Road .	1,200	75	174	229	433	678	664	605
	M/s Mysore M/c Mfrs., Bangalore .	720	484	608	667	468	378	772	713
	M/s CIMMCO, Gwalior	2,400	1,321	2,005	1,977	1,651	1,918	2,101	3,301
	M/s India M/c, Calcutta . .	720	..	..	..	..	177	327	338
	M/s Shri Bansi Inds., Patna . .	600	..	..	..	..	..	11	..
	M/s Ravi Industries, Thana . .	1,200	..	..	..	..	..	..	162
	M/s Inventors Inds. Corpn. . .	360	..	..	..	..	..	..	58
	TOTAL .	7,200	1,880	2,787	2,873	2,552	3,151	3,875	5,177
Looms (Auto).	M/s Cooper Engg. .	600	..	..	..	..	..	..	..
	M/s CIMMCO, Gwalior . . .	2,400	276	70	161	316	36	356	374
	M/s N.M.M., Thana .	1,500	..	..	..	..	..	..	..
	M/s Lakhmiratan Engg., Kanpur .	600	..	..	..	..	..	..	..
	TOTAL .	5,100	276	70	161	316	36	356	374

ANNEXURE B

List of Major Cotton Textile Machinery/Equipment Manufactured in India during 1960

Item of machinery	Production in 1960 (Units)
Carding Engines	1,073
Draw Frames	47
Speed Frames	45
Ring Frames	1,127
Doubling Frame	156
Winding machine	25
Warping machine	3
Looms (Plain)	5,177
Looms (Automatic)	374
Reeling machine	50
Bundling Press	29
Baling Press	12
Jiggers	174
Chemicking machine	10
Padding mangle	36
Washing machine	28
Water Mangle and Drying Range	50
Kiers and Heaters	24
Laboratory Padding Mangle	7
Plating, Doubling, and Folding	54
Starch Mangle	6
Ager	19
Winches	4
Expanders	62
Drying Cylinder	120
Sizing Cylinder	69
Cloth Ptg. Machine	10
Colour Mixer	7
Scutcher	8
Forcing machine	3

ANNEXURE B—*Contd.*

Item of machinery	Production in 1960 (units)
Auto. Piler	6
Stentering machine	5
Drier	1
Dummy Ager	1
Back filling machine	9
Stamping machine	2
Hydro-Extractor	14
Hank Yarn Ptg.	4
Soaper	9
Tensionless Control Device	3
Squeezing machine	11
Mercerising machine	5
Pre-heaters	3
Hydro-cloth conditioning M/c.	1
Laboratory Ptg. M/c.	1
Singeing machine	1
Finishing mangle	1
Batching machine	..
Piece Dyeing Plant	..
Curing machine	..
Damping machine	..
Continuous Wet Dyeing	..
TOTAL VALUE RS. IN LAKHS	1039·41

13. MACHINE TOOLS

Machine tools manufacture hardly existed in India before the Second World War. The imports during the prewar years were of the order of Rs. 2 crores per annum. A few firms, of which mention may be made of M/s. Kirloskar Brothers Ltd., Kirloskarwadi, were engaged in the production of very simple machines such as cone pulley head lathes, shaping machines, presses and hacksawing machines. The output of none of these firms exceeded two to three machines per month. Import of machine tools became difficult during the Second World War and India was forced to depend on her own production. With the active assistance rendered by Government by way of supply of balancing equipment and technicians, some expansion of machine tools manufacture was recorded in the war period. Compared to 1,800 machine tools a year in 1942, the production rose to 11,000 machine tools (of which 3,700 were graded) valued at Rs. 1·12 crores in 1945. The production fell to Rs. 29 lakhs in 1950 and because of this recession, the question was referred to the Tariff Commission. The bulk of machine tools manufactured in the country before 1951 were of simple and primary types of old models which were mainly suitable for use in the small-scale sector where operations were intermittent and high output & rigid adherence to specification standards were not essential. A major development under the First Plan was the establishment of the factory of the Hindustan Machine Tools Ltd. (HMT), at Jalahalli, near Bangalore and the Machine Tool Prototype factory at Ambernath.

I. Review of Progress in the Second Plan:

Target—A provisional target of Rs. 3 crores worth of graded machine tools was indicated for 1960-61 for the public and private sectors together in the Second Five Year Plan, pending submission of the report of an Expert Committee which was appointed by the Government to go into all aspects of the machine tool industry. In 1958 the recommendations of this committee were gone into by the Development Council for Machine Tools which selected such types of machine tools as would prove economic to manufacture and suggested that additional capacity for these tools should be immediately planned. The Development Council for Machine Tools estimated that the demand for machine tools during 1956-60 would be Rs. 73 crores, and the demand for 1960, Rs. 18 crores.

Capacity and Production—The Second Plan period is a landmark for organised manufacture of machine tools in a big way. Not only were heavier machine tools taken up for production, but there was diversification of production as well. The progress of the organised industry in the public and private sectors as well as of the small scale units is briefly outlined below.

Hindustan Machine Tools, Bangalore—By the end of the First Plan, the Hindustan Machine Tools Ltd. commenced manufacturing operations and developed the production of high speed H-22 lathes of 8½" centre height with imported components. The first series of five H-22 lathes manufactured in the factory came off the production lines in May, 1956. In 1957

Government of India bought the shares owned by M/s. Overlikons and terminated the managing rights of the consultant by mutual discussions. Due to the restricted demand in the country for very high precision lathes that are costly, it was considered necessary to diversify production by addition of different types of machine tools to the manufacturing programme. With the technical collaboration of M/s. Fritz Werner of West Germany, HMT started production of six types of milling machines during 1957. In order to diversify the programme still further, the company concluded technical collaboration agreement with M/s. Hermann Kolb of West Germany for the production of radial drill machines, with M/s. Batignolles of France in 1959 for the production of low priced lathes and with M/s. Officina Meccanic Olivetti of Italy for 16 types of cylindrical grinding machines.

An indication of the rapid increase and diversification of production of the company during the Second Plan period is given in the following table:

Progress of Production of Machine Tools by HMT

Machines	1956-57	1957-58	1958-59	1959-60	1960-61
High speed lathes (Nos.)	135	313	240	240	137
Milling Machines (Nos.)	..	89	262	253	310
Radial Drills (Nos.)	..	..	50	78	204
Low price lathes (Nos.)	..	..	..	131	317
Grinding Machines (Nos.)	..	..	..	..	30
Turret Lathes (Nos.)	..	..	..	..	2
Special Machines (Nos.)	..	..	..	..	2
TOTAL	135	402	552	702	1,002

With the rapid increase in production, HMT was able to reduce progressively the prices of the machine tools manufactured by it. As a result of the progressive increase in output, the net profit earned by the Company went up from Rs. 4·0 lakhs in 1956-57 to Rs. 74·0 lakhs in 1960-61.

An Industrial Estate has been developed around Hindustan Machine Tools for supply of components/sub-assemblies to be used in manufacture/assembly of the main products or as accessories to the main products. These ancillary feeder units will be useful adjunct to heavy industries in decentralising production and promoting specialisation in the main work.

With a view to overcoming the continued difficulties experienced by the factory in the procurement of castings especially in respect of new production lines, a foundry project with an estimated cost of Rs. 60 lakhs and with an ultimate capacity of 6000 tons was approved in 1959 for implementation by the H. M. T. The construction was started in December, 1959 and completed in May, 1961. The foundry started production in June, 1961.

It was decided that the Second Machine Tool Factory in Bangalore designed to double the output of HMT to 2,000 machines per annum corresponding to Rs. 7 crores in value should be entirely financed from the internal resources of HMT. The project was estimated to cost Rs. 3 crores with a foreign exchange element of about Rs. 2 crores. The construction of this unit commenced in April, 1960 and was completed in May, 1961, ten months ahead of schedule. It was built without any foreign collaboration.

Praga Tools Corporation, Secunderabad—The output of machine tools accessories and machine tools from this factory was of the order of Rs. 19 lakhs in 1960. The production mainly centred round drilling machines and machine tool accessories. The factory also produced a few bench lathes and milling machines.

Machine Tools Prototype Factory, Ambernath—This factory in the Defence sector is manufacturing tool room lathes, capstan lathes and surface grinders. The output of machine tools from this factory was Rs. 20 lakhs in 1960.

Organised Private Sector—In this sector, at the beginning of the Second Plan, production was mainly confined to simple lathes, drilling machines, shaping machines etc. During the Second Plan, besides substantial increase in the production of these, manufacture of more complicated type of machines has been achieved. The highlights are summarised in the subsequent paragraphs.

Messrs. Mysore Kirloskar Ltd. undertook the manufacture of Capstan and Turret Lathes in collaboration with Messrs. Alfred Herbert of U.K. The production of these lathes commenced in 1960, and in the manufacture of capstans substantial indigenous content has been achieved.

A start in the manufacture of what may be considered as Heavy Machine Tools was made when M/s. Cooper Engineering Ltd., commenced the production of modern planing machines in collaboration with Scottish Machine Tools Ltd., U. K. They have also undertaken the manufacture of slotting machines in collaboration with Techno-Export, Czechoslovakia. They have further entered into collaboration agreement for the manufacture of vertical turret lathes with Schiess of West Germany. For the implementation of the above expansion programme they have established a new factory for machine tools exclusively.

Messrs. Investa Machine Tools and Engineering Co. Ltd., Bombay, who were one of the earlier manufacturers in this line have done considerable pioneering work in developing original designs. After establishing manufacture of lathes and geared head drilling machines, they have developed a radial drilling machine of their own design. To meet the increasing demand for machine tools they have undertaken substantial expansion and are shifting the factory to a new location.

Another major development, where foreign capital participation in the machine tool industry has taken place, was the formation of Messrs. Ex-Cell-O (India) Ltd. Their principals, Messrs. Ex-Cell-O Inc. of U. S. A.

are one of the leading manufacturers of very high precision machine tools. The Indian factory has gone into production of precision boring and grinding machines, milling machines etc.

Messrs. New Standard Engineering Co. who were formally making drilling machines etc. have entered into a technical collaboration with Messrs. Massey Ltd. of U. K. for the manufacture of pneumatic hammers. The production of these items has commenced and the firm has finalised plans for the manufacture of heavier types of drop hammers also. Messrs. Godrej & Boyce Mfg. Co., Bombay, have established a separate machine tool division where they are producing sheet metal working machinery such as presses, press brakes etc. Portable Electrical and Pneumatic Tools were produced in the country for the first time with the establishment of Messrs. Railiwolf India Ltd. for the manufacture of electrical tools and two firms namely Messrs. Consolidated Pneumatic Tools Co. Ltd., Bombay and Messrs. Holman Climax Mfg. Private Ltd., Calcutta, for pneumatic tools.

The details of capacity installed in the Second Plan period in the organised private sector is given in the following table :

Name of the Firm	Types of machine tools manufactured	Increase in capacity during 2nd Plan. (Rs. lakhs)
1	2	3
M/s. Cooper Engg. Ltd., Satara	Shaping Machines, Slotting Machines, Planing Machines	25
M/s. Indian Oxygen, Ltd., Calcutta.	Gas Welding & Cutting Equipments .	25
M/s. Madan Engg. Tool Products, Delhi.	Power Presses	8
M/s. Metal Box Co. of India Ltd., Calcutta.	Special Can Making Machines . .	10
M/s. National Electrical Industries Ltd., Bombay.	Double Ended Grinders, Polishing and Buffing Machines	5
M/s. Mysore Kirloskar Ltd., Harihar.	Lathes-Cone-Pulley and Geared Head, Hacksaw Machines, Capstans and Turrets	20
M/s. New Standard Engg. Co., Bombay.	Drilling Machines, Rail Cutting Hacksaws, Pneumatic Hammer .	7
M/s. Ralliwolf Ltd., Bombay .	Portable Electrical Tools . . .	14
M/s. Shree Ram Mills Ltd., Bombay.	Lathe Chucks	8
M/s. Consolidated Pneumatic Tools Co., Bombay.	Portable Pneumatic Tools . . .	9
M/s. Godrej & Boyce Mfg. Co., Bombay.	Sheet Metal Machinery . . .	10
M/s. Madras Machine tools Ltd., Coimbatore.	Lathe Cone-Pulley, Bench Grinders .	5

1	2	3
M/s. Industrial & Engg. Foundry Co., Coimbatore.	Lathes Cone-pulley, Drilling Machines	5
M/s. Hokman Climax Mfg. Pvt. Ltd., Calcutta.	Portable Pneumatic Tools . . .	5
M/s. Ex-cell-O (India) Ltd., Bombay.	Hydraulic Unit Heads Grinding and Boring Spindles, Precision Boring Machines, Internal Grinders, Milling Machines, Carbide Grinders . .	25
	TOTAL .	181

It will be seen from above that the capacity in the organised private sector increased by Rs. 1·8 crores worth of machine tools during the Second Plan period.

Small Scale Units—An All-India survey of the small scale units in the machine tools field was carried out in 1958 by the Small Industries Services Institutes of Bombay, Calcutta, Madras and New Delhi. The value of production in the small scale sector was estimated at Rs. 0·82 crore in 1955 and Rs. 1·30 crores in 1956. Regionwise information relating to the number of units and their estimated production as in 1957 are given below :

Region	Number of units	Estimated production (Rs. crores)
Northern (Punjab and Delhi)	257	1·30
Western (Bombay, M.P. and Mysore)	45	0·30
Eastern (West Bengal and Bihar)	30	0·45
Southern (Madras, Andhra and Kerala)	12	0·04
TOTAL .	344	2·09

Of the units in the Northern Region, about 250 units are in the Punjab, the major concentration being at Batala and Ludhiana. These firms mainly manufacture machines like cone pulley lathes, low priced planing and shaping machines, hacksaw machines, power presses etc. Some of the firms also manufacture machinery for the production of wood screws, wire nails etc.

Although further surveys have not been undertaken, it is believed that the production in this sector has risen considerably due to :

(1) incentives given by Government to small scale units.

(2) restrictions on the import of foreign made parts.

(3) pressure of demand for renovation of old machinery.

(4) demand for ungraded machine tools which most of the small scale concerns manufacture on account of low price.

(5) Organised sector being not in a position to meet the full demand of the country.

Overall Position.—The production of machine tools in the organised sector, public and private, is given below:—

	(Rs. crores)
1955	0·74
1956	1·20
1957	2·51
1958	3·76
1959	4·39
1960	7·24

The contribution of HMT alone to the figures of 1960 production is Rs. 3·1 crores. Taking into account production worth Rs. 2 crores by the small scale sector, the total annual production of machine tools in 1960 would be Rs. 9 crores.

Imports.—The rising trend of imports of machine tools will be seen from the following table :

	Imports (Rs. crores)
1950	2·49
1951	2·50
1952	2·21
1953	3·13
1954	3·85
1955	5·29
1956	8·37
1957	11·32
1958	12·61
1959	11·61
1960	12·24

Demand—Adding up the figures of import and indigenous production, broad figures for demand of machine tools can be obtained. Working

on this basis, the demand for machine tools is computed as follows since 1941:

(Rs. crores)

Period	Import of machine tools	Indigenous manufacture	Total demand for machine tools
1941—45	5·14	2·60	7·74
1946—50	16·33	2·68	19·01
1951—55	16·99	2·59	19·58
1956	8·37	1·20	9·57
1957	11·32	2·51	13·83
1958	12·61	3·76	16·37
1959	11·61	4·39	16·00
1960	12·24	7·24	19·48
1956—60	56·15	19·10	75·25

The indigenous manufacture indicated above covers the production of only the organised public and private sectors. Including the production figure of Rs. 2 crores of the small scale sector, the demand of machine tools in 1960 would be Rs. 21 crores approximately.

Investment.—Investment made in the industry during Second Plan period is estimated to be about Rs. 4·5 crores. This includes an investment of over Rs. 1 crore made on Hindustan Machine Tools.

Development Council.—A Development Council for machine tools industry was constituted in January, 1957. The Council made significant contribution to the preparation of the development programme for the Third Plan.

II. Programme of Development in the Third Plan:

Estimated Demand.—Detailed study of the demand for machine tools in 1965-66 was undertaken by a sub-committee of the Development Council for Machine Tools in 1960. In assessing the future requirements, different approaches were adopted, which are discussed briefly below :—

(i) Actual demand figures for machine tools were obtained by adding figures of import and indigenous manufacture; from a practical projection of these figures, demand for 1965 was estimated to be Rs. 58 crores worth of machine tools.

(ii) From past gross investment figures, the ratio of the machine tools installed to the overall investment in industry was found to be 6·5% ; on this basis the annual demand of machine tools in 1965 was estimated to be Rs. 44 crores.

(iii) the ratio of additional machine tools installed to the increased installed capacity of 40 major industries was determined for the First and Second Plan periods and the demand for 1965 projected on this basis comes to Rs. 41·6 crores.

As a broad mean of the above three figures, the Development Council recommended a figure of Rs. 49 crores for 1965. The demand for other metal working machinery has been assessed by the Council at Rs. 14·6 crores. The combined total demand would work out to Rs. 63·6 crores. The breakdown of the pattern of demand has also been indicated by the Development Council.

Target—Taking into consideration the variety of problems to contend with in stepping up the capacity in this field in the short-term, a target for annual capacity and production of Rs. 30 crores worth of machine tools has been envisaged for 1965-66. The sector-wise breakdown of this target has been suggested as follows :—

	(Rs. crores)
Public sector	16
Organised Private sector	14

In view of the high priority of this industry and the gap that would still remain to be covered for meeting the estimated demand fully from indigenous sources, further expansion of capacity is *prima facie* welcome in this field. In other words, the target does not set a ceiling for development programmes and favourable consideration would have to be given to well conceived schemes for increasing the domestic production further so as to narrow down the import requirements.

Capacity and Expansion Programmes in Public Sector

Hindustan Machine Tools, Bangalore—The Second Machine Tool project of HMT designed to double the capacity of this unit from 1,000 machine tools to 2,000 machine tools *per annum* was expected to spill over in the Third Plan period, but it has already been completed in a record time in April, 1961. The Company has entered into a technical collaboration agreement with M/s. Renault of France for the manufacture of special purpose machines.

New Machine Tools Plant in the Punjab—The setting up of a new machine tools plant in the Punjab with the collaboration of Limex of German Democratic Republic (GDR) has been approved by the Government. The technical know-how and the machinery and equipment required in this connection are proposed to be obtained from the GDR on non-convertible rupee payment basis. This plant, with its annual capacity of 1,000 machines, will involve an investment of Rs. 7·5 crores, of which Rs. 3 crores will be the foreign exchange element. The capital will be provided by the HMT from the profits earned by it and the time taken for the unit to go into production has been estimated to be three years from the date of sanction. The production programme has been envisaged as follows :—

	Nos.
Milling Machines	550
Gear cutting machines	100
Special purposes Machines	350

Heavy Machine Tools Factory—With the assistance of Czechoslovak Government, the total capacity of the proposed factory to be established at Ranchi is being planned for 10,000 tons *per annum* including the production of special accessories, spare parts etc. Annual production of complete machine tools will be 7,000 to 10,000 tons when full production is achieved.

The production programme of this factory is planned in 4 phases. During the first phase, the production of lathes, planers and radial drills is expected to be taken up. The manufacture of other types of machines will be taken up in next two phases. The interval between the consecutive phases will be one year. Maximum production is expected to be reached two years after the starting of production of different phases. It will thus be seen that the maximum production of this factory—Rs. 8 to 9 crores—will be achieved only after the conclusion of the Third Five Year Plan. Tentatively an output of about Rs. 3 crores is reckoned from this project in 1965-66.

Praga Tools Corporation, Secunderabad.—It is proposed to reorganise the Praga Tools Corporation as mainly a machine tool manufacturing unit under the expansion programme. With the technical collaboration of the following three British firms, its present production figure of Rs. 19 lakhs worth of machine tools *per annum* is planned to be increased by about Rs. 50 lakhs:

(i) M/s. Kearney & Treaker—CVA Ltd. of Hore Sussex, for the manufacture of drill chucks.

(ii) M/s. A. A. Jones & Shipman Ltd. of Leicester, for the manufacture of cutters & tool grinders.

(iii) M/s. F. Pratt & Co. of Halifax, for the manufacture of lathe chucks.

In March, 1961 an agreement was entered into with CEKOP, an organisation in Poland which undertakes the design and supply of complete plants. The foreign exchange expenditure for further expansion of Praga Tools involved under this scheme has been estimated at Rs. 1·5 crores out of which a sum of Rs. 1 crore has been set apart from the Polish Government credit. The rupee expenditure has been anticipated to be about Rs. 1·5 crores excluding working capital. The tentative production programme under the proposed Polish collaboration will be:

Machine Tools	Annual production in 1st stage (by 1962) (Nos.)	Annual production in 2nd stage (by 1966) (Nos.)
Universal Lathe	240	720
Bench Lathes	240	480
Milling Machines	300	420
Bench Drills	720	1,200
Column Drills	180	360
Tool & Cutter Grinders	240	360
Tapping Machines	60	120

Machine Tool Proto-type Factory, Ambernath.—An expansion programme for this factory is under implementation and manufacture of single spindle automatics is proposed to be taken up during the Third Plan period. This proto-type factory is expected to make a contribution of about Rs. 1 crore worth of machine tools to the civil market *per annum* by 1965-66. On the basis of the schemes and their timing as outlined above it is envisaged that in 1965-66 the output of the public sector enterprises will be as follows:

	(Rs. crores)
Hindustan Machine Tools	7
Plant in Punjab	3
Heavy Machine Tool Factory	3
Pragas	2·5
Proto-type factory	1
TOTAL	16·5

Capacity in organised private sector.—Licences under the Industries (Development and Regulation) Act for substantial expansion of a number of existing units and for a number of new units have been given. Although some of the schemes may not materialise, it is expected that the expansion/new units already licensed will make a significant contribution to machine tool production. The expansion programme in the private sector has been formulated against the demand forecast for the different groups and families of machine tools and so as to ensure that it is complementary and supplementary to the public sector programme. The product mix proposed in the various schemes is *prima facie* satisfactory.

The state-wise distribution of the existing as well as the licensed units yet to be installed is indicated below:

State	Installed units	Licensed units
Bombay	11	25
West Bengal	7	21
Punjab	3	8
Madras	2	8
Delhi	2	3
Andhra	..	1
Mysore	2	1
Madhya Pradesh	..	1
Uttar Pradesh	..	1
TOTAL	27	69

Machine tools are the basic machines of production and form the backbone of industrialisation. The state of development achieved in the machine tool industry has a direct bearing not only on the quality of the manufactured goods in other industries but also in the productivity that can be achieved by the various industries. In view of this, it is of paramount importance that high priority is accorded to the requirements of the machine tool industry both in regard to capital goods and raw materials, whether imported or indigenous. It is also necessary to equip the machine tool manufacturing units with the best equipment available so that the products manufactured by them would be to international standards.

Raw Materials—For a production of Rs. 30 crores worth of machine tools, the requirements of raw materials are as :

	Tons
Pig Iron	34,000
Rolled Steel	19,000
Bars & rods	17,100
Plates	1,600
Wires	300
Alloy Steel	5,000

Investment & Foreign Exchange—The figures of approximate investment in the machine tool industry in the Third Five Year Plan are given below :

	(Rs. crores)
Large scale public (*vide* page 139)	22
Large scale private	18
TOTAL	40

The estimated foreign exchange requirement for the period 1961-65 comes to about Rs. 27 crores with the following breakdown :—

	(Rs. crores)
Large scale public	16
Large scale private	11
TOTAL	27

Technical Know-how and Personnel—Machine tool manufacture is a specialised industry. Most of the manufacturers have arranged for technical collaboration with well-known foreign firms. While dependence on such technical know-how in the initial stages is necessary, efforts should be made to reduce such dependence by creating within the country the necessary skill and designing knowledge.

An institute for machine tool technology and design is proposed to be set up as an autonomous body at Bangalore. For reasons of economy this will be located in the vicinity of HMT Ltd. This Institute will not only

be responsible for the preparation of designs and the training of design personnel, but will also undertake machine tool research, production engineering research and act as a centre for the dissemination of technical information on machine tool problems. The total cost of the institute has been estimated to be Rs. 89 lakhs, of which Rs. 60 lakhs will be a gift from the Czech Government. The institute is not expected to replace the normal design facilities that should be available with each of the major units. It will be a centre for pooling knowledge and solving common technical problems pertaining to the machine tool industry as a whole.

The shortage of technical and skilled personnel is likely to present difficulties for this industry unless timely arrangements for training are made. For the units in the public sector, special arrangements are being made for training the technical personnel. HMT have already got a training programme under way. Similar training facilities are also available at the Machine Tool Proto-type factory at Ambernath and Praga Tools Corporation at Secunderabad.

For providing technical assistance and training facilities for the small scale industrialists engaged in the manufacture of machine tools, 4 centres are being opened by the Central Small Industry Organisation as follows :—

(i) A proto-type production and training centre in collaboration with the West German Government at Okhla to develop proto-type machine tools, which can later be taken up by small scale industrialists and to give training to workers.

(ii) A centre with similar objectives under TCM assistance at Rajkot.

(iii) A proto-type centre in collaboration with Japanese Government at Howrah.

(iv) A centre under French collaboration at Madras for manufacture of precision instruments and gauges.

14. CONSTRUCTION EQUIPMENT

The scope of this programme covers earth-moving equipment like crawler tractors, dumpers and scrapers, shovels and road rollers. Earth moving equipment has come into wide use in recent years, in the execution of the multipurpose river valley projects, mining, road making and reclamation work. By and large rollers of 8 to 10 tons capacity have become the standard size in this country though rollers of smaller sizes have limited use in the making of village and private roads. These construction equipments are generally powered by diesel engines.

(I) Earth Moving Equipment

1. Review of progress in the Second Plan period :

Crawler tractors, dumpers, scrapers and shovels are included under this head. These are expensive machines and until 1955 the volume of demand for these was not considered adequate for taking up their manufacture in the country economically. A committee was appointed by the Ministry of Commerce & Industry in 1955 to examine the scope for the manufacture of these items in the country and to assess the likely future demand for these equipments. The Committee assessed the demand for the various items covering a period of five years for the river valley projects and the mining operations connected with mineral development programmes. The total requirements of the country over a period of five years for the principal items have been consolidated as under:

	Nos.
Crawler tractors e150 to 160 D.B.H.P.	1,100
Motorised Scrapers & Dumpers	1,200
Towed Scrapers	200
Shovels and Drag lines	275

Capacity in the private sector.—The position regarding capacity in operation and under implementation for the production of the different types of equipments at the end of the Second Plan period is indicated below:—

Firm	Collaborator	Item of machinery	Licensed capacity
1	2	3	4
	A. Already in operation		
M/s. Tractors & Bulldozers Ltd., Bombay.	Vickers Armstrong (Tractor) Ltd., U.K.	Bulldozer attachment, Scraper attachment.	60 Units.
	Tractor Spares Ltd., U.K.	Track parts of Crawler Tractors	
M/s. Trackparts of India Ltd., Kanpur.	Track parts Ltd., U.K.	..	..
M/s. Automobile & Agricultural Industries, Bombay.	Nil	Do.	..

1	2	3	4
	B. Capacity under implementation		
M/s. Hindustan Motors Ltd., Uttarpara (W. Bengal).	Cater-pillar Co., U.S.A.	Tractor Spare parts for cater-pillar tractors, towed parts of scrapers and dumpers (trailor portion only).	Yet to be fixed.
	Marion Power Shovel Co., U.S.A.	Marin Shovels/ excavators.	
M/s. Tata Engg. & Loco. Co., Jamshedpur.	Harnishforger Corp., U.S.A.	P. & H. Excavators along with replacement parts.	50 units

Capacity in the public sector.—In September, 1958 the Ministry of Defence entered into an agreement with M/s. Komatsu Mfg. Co. of Japan for manufacture of three sizes of crawler tractors designated as D40, D80 and D120 types of tractors. By about the beginning of the Third Plan a capacity for the production of 180 crawler tractors has been created in the Cossipore Ordnance Factory to meet the Defence as well as civilian requirements. The Ordnance Factory has supplied to the services as well as to the civilian sector a total of about 570 Komatsu type crawler tractors. The indigenous content achieved so far is about 30%. An organisation has also been recently created to back up supplies to the civilian sector with adequate after-sale service *viz.* maintenance facilities and spares supply.

II. Programme of Development in the Third Five Year Plan:

Target.—Based on the survey of requirements in the Second Plan period made by the Committee appointed by the Ministry of Commerce & Industry and on the assumption of a doubling up of these demands by the end of the Third Plan period and the initial years of the Fourth Plan, the following targets have been envisaged for 1965-66:

	Nos.
Crawler Tractors:	
Capacity	600
Production	500
Dumpers and scrapers:	
Capacity	600
Production	500
Shovels:	
Capacity	125
Production	100

New schemes under implementation.—The details of the schemes which are in the varying stages of implementation have been given in the table under para 3. By and large, this industry is still in its very early stage and requires to be carefully nurtured, so that the production in due course will be extended and diversified to meet the demands in full. Further capacity to be created to meet the demand particularly for dumpers, scrapers and shovels, arising by the end of the Third Plan is being considered.

Public Sector Project.—In order to meet the increased civilian demands it has been proposed to increase the production capacity of the Ordnance Factory at Cossipore so as to have a rate of production of 1·4 crawler

tractors per day *i.e.* about 500 crawler tractors per year. The latest assessment of the phasing of expansion is that the annual production of tractors might be 300 units in 1962-63 and thereafter could be raised to 500 tractors by the end of the Third Plan period. A second unit for tractors is therefore not likely to be required.

Miscellaneous.—Diesel engines between 60 to 300 H.P. are required for powering the various types of earthmoving machinery referred to. These have been discussed in the diesel engine section of the programme of Agricultural Implements and Machinery.

(II) Road Rollers

I. Review of progress in the Second Plan period:

Road rollers were manufactured in the country during the Second World War, but this activity stopped soon after. Interest in their production was revived in 1955 when M/s. Jessop & Co., Calcutta came forward with their manufacturing proposal followed by some other firms. A Road Roller Committee, appointed in 1956 by the Ministry of Commerce and Industry to investigate into the scope for the manufacture of road rollers in the country, envisaged an annual demand of about 400 road rollers by the end of Second Plan period. The bulk of the demand was envisaged to fall in 8 to 10 tons range. This assessment was broadly made the basis for regulating the capacity of this industry in the country during the Second Plan period.

Capacity.—Practically the whole of the existing installed capacity for this industry was created during the Second Plan period. The details of the installed capacity are given below:

Firm	Details of road roller	Collaborator	Annual Licensed capacity (Nos.)
M/s. Jessop & Co. Ltd., Dum Dum.	Diesel 8-10 tons capacity	Aveling Berford Ltd., U.K.	150/200
M/s. Britannia Engg. Co. Ltd., Titagarh.	Diesel & Steam 8-10 tons capacity.	Marshall Sons & Co., U.K.	120
M/s. Agrid Fabrications Ltd., Calcutta.	Diesel 8-10 tons capacity.	Moore Road Machinery, Australia.	144
M/s. Kamani Engg. Corp. Ltd., Bombay.	Tractamount Road Roller Chassis of 3-5 tons capacity.	E. V. Tose Ltd., U.K.	120/360

The present annual installed capacity comes to about 414 to 464 numbers per annum for standard type of road rollers (excluding the road roller chasis referred to above). M/s. Britannia Engineering Co. Ltd., are also manufacturing a limited number of steam road rollers. Although the demand for steam road rollers has been gradually decreasing, the capacity available with the firm would be utilised to meet the spare parts requirements of the steam road rollers now in operation as also the needs of those users who still prefer to use steam road rollers. M/s. Kamani Engineering Corporation will produce a chassis which could be used as a road roller of 3 to 5 tons capacity after fitting the necessary parts, or as a tractor of the commercial type.

Production.—The regular production by the indigenous industry started in the latter part of 1957. The production since 1958 is as given below:

	Nos.
1958	104
1959	158
1960	388

The value of production in 1960 has been estimated at Rs. 1·5 crores. The performance of road rollers manufactured by the firms is considered satisfactory. The one major component that is still being imported is the transmission unit. Recently, these have also been undertaken for manufacture.

Imports.—The imports of road rollers, as reported in the Monthly statistics of Foreign Trade of India, are reproduced below:

	Rs. lakhs
1957	0·12
1958	27·00
1959	16·12
1960	1·37

Investments.—Investments made on the road roller projects during the Second Plan period have been estimated to be Rs. 20 lakhs.

II. Programme of development in the Third Plan:

Estimated Requirements and Target.—The Road Roller Committee, appointed by the Ministry of Commerce & Industry, expressed the view that the requirements of road rollers in the country during the Third Plan period may range between 2,500 to 3,000 Nos., excluding the requirements of Irrigation & Power Department, Central Public Works Departments, Defence and Railway Ministries. The demand of private parties like cement factories, tea gardens, oil refineries and other private industries, who make their own roads, would be in addition to these requirements. Taking these additional demands into account, a production target of 700 Nos. of road rollers for 1965-66 has been fixed. The corresponding target for capacity has been set at 800 Nos. About 60% of this demand is expected to be for 8-10 tons capacity.

New Schemes and overall position.—A new proposal was approved in 1960 in favour of M/s. Garlic & Co. Ltd., Madras, for the manufacture of 1:5 tons vibrating type, 3 to 4 tons tandulam road rollers. The capacity is being installed for the production of 100 machines per annum. Recently, both M/s. Jessop & Co. Ltd., and M/s. Britannia have undertaken to effect substantial expansion to their existing undertaking and thereby increasing their capacity by another 180 Nos. per annum each. The former will undertake to manufacture 3 tons vibrating type, 5 to 6 tons and 6 to 7 tons tandulam road rollers, while the latter will continue to manufacture the 8 to 10 tons sizes.

The aggregate of installed and licensed capacity for this industry thus exceeds 800 Nos. per year and there appears to be no difficulty in achieving the target stipulated for the industry.

Miscellaneous.—The programme for the development of diesel engines required for use on road rollers has been discussed separately in the diesel engines section of the programme on Agricultural Implements and Machinery.

15. STEAM BOILERS

I. Review of Progress in the Second Plan:

No development programme was formulated and specific targets set for steam boilers under the Second Plan.

Capacity and Production.—Prior to 1956 there were hardly any steam boilers manufactured in the country. The installed capacity by 1960-61 is equivalent to Rs. 3·7 crores worth of boilers equipment on single shift basis, of which M/s. A. C. C.-Vikers-Babock Ltd., Durgapur account for Rs. 3·07 crores. Manufacture of Lancashier, Cornish, Economic, Vertical and Water Tube boilers has been undertaken. The annual production figures for the last five years are given below:

	(Rs. lakhs)
1956	6·85
1957	5·14
1958	9·15
1959	8·47
1960	52·63

Import.—The import figures of steam generating boilers are given below. The figures do not cover loco boilers and accessories and also boilers imported as self-contained steam engines:

	(Rs. crores)
1957	8·51
1958	9·05
1959	9·08
1960	5·13

Employment.—The employment by 1960-61 has been estimated to be about 540.

II. Programme of Development in the Third Plan:

Estimated requirements.—In order to assess the requirements of boiler plant and machinery, the following factors are required to be taken into consideration :—

(i) Requirements of industrial boilers for use in important industries like nitrogenous fertilizers, sugar, cement and paper.

(ii) Requirements of the proposed thermal power stations as indicated by Central Water Power Commission, Defence and other public sector projects.

(iii) Spare and replacement requirements taking into consideration the obsolete plant due for renovation.

The Machinery Working Group of the Planning Commission estimated the total requirements of boilers per annum by the end of the Third Plan as below:

Industry in which required	Rs. crores	tons
Thermal Power Stations	18·00	30,000
Sugar Industry	1·25	19,375
Nitrogenous fertilizer	1·50	
Cement	1·00	
Other Industries	4·00	
Spare accessories etc.	8·00	8,000
TOTAL	33·75	57,375

Broadly it can be taken to be about 58,000 tons or Rs. 34 crores worth of boiler equipment.

Targets.—Taking into consideration the number of problems to contend with in stepping up the capacity of this industry in a short time, the following targets have been envisaged for 1965-66:

	(Rs. crores)
Production target	25
Capacity target	29

Schemes in the Private Sector.—Development programmes as given in Appendix A are under implementation. The figures of capacity licensed are on single shift basis. It will be seen that schemes covering a total of Rs. 7·09 crores worth of boilers have been licenced. Of the licensed schemes, M/s. Walchandnagar Industry and M/s. Texmaco., are reported to have just started production.

M/s. Associated-Vickers-Babcox Plant at Durgapur have been designed to produce large and high pressure boilers of say upto 100,000 lbs. per hour evaporation. This unit has a capacity for producing boilers equivalent to 350 MW per year. This plant is expected to start giving output by 1962.

Capacity in the Public Sector.—To cover the large gap in the manufacturing capacity for the high pressure boilers, a new plant has been planned in the public sector under the Third Plan period in collaboration with Czechoslovakia. Necessary foreign exchange for this project has been found from

within the Rs. 23·1 crores Czech credit. After taking all factors into consideration the Government of India have accepted the recommendations of the Technical Committee on Heavy Electrical projects and decided to locate this plant at Tiruchirapalli in Madras State. The factory will be designed for development in two stages. In the first stage it will produce high pressure boilers of 125, 165, 200, 230 and 330 tons of steam per hour. The total estimated output of this factory in the first stage is about 2,500 tons of steam per hour (30,000 tons of iron). It will be a self-contained unit which will be able to fabricate the welded drums needed for the boilers and also produce its own requirements of the high pressure valves and fittings needed for the boilers. In fact, the capacity for valves and fittings of this plant will be of the order of 2,425 tons and this is expected to leave nearly 1,500 tons of valves and fittings for free market consumption. This plant will also be equipped for the manufacture of coal handling and the ash handling equipment needed for the power stations where these boilers will be installed. The detailed project report which is under preparation takes into consideration the possibilities of doubling the output of this plant in the next stage of development and also to produce boilers of sizes suitable for 200 MW Steam Turbo Generator sets. This plant will be the biggest in its category in India and is estimated to cost about Rs. 15 crores in the first stage out of which the foreign exchange requirements will be of the order of Rs. 6 crores. The saleable output from this plant on reaching the targetted production in the first stage would be about Rs. 12 crores.

Raw materials.—The principal raw material requirements for a production target of Rs. 25 crores worth of boilers are given below:

	(tons)
Rolled & drawn Steel without tubes	45,000
Tubes-Carbon & Alloy Steel	21,000
Castings-grey iron & steel	8,200
Forgings	5,700
Refractory Linings	12,000

One of the essential requirement for the manufacture of these boilers is steel plates of thickness 90 to 120 mm, which are expected to be rolled out from Rourkela.

APPENDIX A

Names and addresses of the firm	Location	Type of boilers licensed for	Collaborator	Annual licensed capacity (Value in Rs. crores)
M/s. Texmaco, Belghurria	Belghurria	Lancashire, Cornish, Economic & Vertical Boilers.	M/s. Combustion Engg. (Inc), U.S.A.	0·24
		Water tube boilers upto 75,000 lbs. per hour evaporation & 400 lbs. per sq. inch pressure.	..	..
M/s. K. C. P. Ltd., 38, Mount Rd., Madras	Madras	Water tube boilers upto 4,500 lbs. per hr. evaporation & upto 300 lbs. per sq. inch pressure.	M/s. Fives Cail Ltd., France.	0·30
M/s. Walchandnagar Inds., Walchandnagar P. O., Distt. Poona.	Walchandnagar	Water tube boilers upto 7,500 lbs. per hr. evaporation and pressure upto 430 psi.	Skodas of Czechoslovakia	0·30
M/s. Indian Sugar & Genl. Engg. Corporation Ltd., Yamunanagar.	Yamunanagar	(a) Boilers for general industrial use upto 15,000 lbs. per hour evaporation and pressure upto 430 lbs. psi.	M/s. John Thompson Ltd., U.K.	0·45
		(b) Water tube boilers upto 75,000 lbs. per hour evaporation. 430 lbs. psi.		0·25
M/s. A. V. B. Ltd., Meco House, Brabourne Rd., Calcutta.	Durgapur	Industrial boilers & thermal station boilers.	M/s. Babcock & Wilcox Ltd., U.K.	3·07
M/s. Nestler Boilers (P) Ltd., Love Lane, Bombay.	Bombay	Package boilers upto 500 lbs. pressure per hour evaporation and 100—125 psi.	M/s. Prr & Sembower, Pennsylvania, U.S.A.	0·25
M/s. Structural Engg. Co. 127, M. G. Road, Fort, Bombay.	Bombay	Vertical & Horizontal cochran Boilers.	M/s. Cochran & Co. Annan, U.K.	1·03
M/s. Thapper-Steinmuller Karam Chand Thapar & Bros. Ltd., 25, Brabourne Rd., Calcutta.	Poona	Package, Water tube & Thermal Station Boilers.	M/s. Steinmuller	1·20
			TOTAL	7·09

16. INDUSTRIAL AND SCIENTIFIC INSTRUMENTS

In the field of scientific education and industry, instruments play an important role as essential devices for measuring, controlling and regulating physical and chemical properties and operations in accordance with scientific laws. The range of instruments vary from simple type of mathematical and drawing instruments used in schools to very complicated instruments with high degree of precision which find application in industry and research institution. Apart from their use in technical and scientific institutions, in medicine, meteorology, geology, astronomy and navigation control, instruments have come to play an increasingly important role in modern industrial development. In an expanding economy with emphasis on industrial growth and technical education, the importance of developing the instrument industry so as to meet the major requirements of these essential items from within the country cannot be over-emphasised.

The varieties of instruments in use are far too many to admit of easy classification. Taking into consideration the present stage of development of the instrument industry in this country, the types of instruments in use and/or required may be broadly classified as follows :

(a) Scientific instruments used in schools, colleges and research institutions. These would include simple optical instruments, electrical instruments and other laboratory equipment.

(b) Surveying, mathematical and drawing instruments such as levels, theodolites, drawing instruments etc.

(c) Industrial process and control instruments such as those used in manufacturing industries, power plants etc.

The present position and development programmes for these instruments are discussed below. The programmes for surgical instruments, medical appliances and for house service meters are discussed elsewhere in this volume.

1. Brief Survey of the Industry :

The first step towards the manufacture of modern instruments in this country is reported to have been taken as early as in the fifties of the last century. The manufacture of survey and drawing instruments at Roorkee dating from that period was associated with the construction of the Ganga Canal. The establishment of the Thompson College of Civil Engineering at Roorkee near about the same period further encouraged the manufacture of these types of instruments. Towards the close of the last century the manufacture of laboratory instruments and apparatus was taken up at Ambala. Gradually Ambala and Roorkee grew to be centres of the instruments industry and a number of small-scale producers came into existence. In spite of this early start the progress has been slow and it is only in the last decade that some appreciable development of the industry has been achieved.

Capacity.—There are at present 37 large units on the list of the Development Wing engaged in the manufacture of scientific, drawing, surveying, mathematical and industrial instruments. In addition there are a large number of units operating in the small-scale sector.

The capacity of the 37 units in the large-scale sector is estimated at about Rs. 3·5 crores worth of instruments annually. The type of instruments produced by them include various scientific instruments, water meters, microscopes, binoculars, telescopes, spectrometers, optical benches, electrical indicating instruments, theodolites, levels, compasses, surveying instruments, geometry boxes, thermometers, pressure gauges, industrial instruments etc. The regional distribution of these units is indicated below :—

State	No. of units
West Bengal	9
Maharashtra	6
Gujerat	1
Punjab	4
U.P.	7
Andhra	2
Madras	2
Mysore	2
Delhi	4
TOTAL	37

Four of these units, *viz.* National Instruments Factory, Calcutta, Precision Instruments Factory, Lucknow, Ordnance Factory, Dehra Dun and Government Electric Factory, Bangalore are in the public sector.

An All-India survey by the Economic Investigation Teams presented the picture of the instrument industry as in 1958 in the small-scale sector. According to this survey, 213 small scale units employing on an average 10-20 workers and with a maximum investment of Rs. 64,000 were reported to be in existence at that time. Their state-wise distribution is given below:—

State	No. of small-scale units
Bombay (Maharashtra and Gujerat)	16
Madhya Pradesh	4
Mysore	6
Punjab	68
U.P.	89
Delhi	6
West Bengal	15
Bihar	2
Andhra	5
Madras	1
Kerala	1
TOTAL	213

The principal centres of small-scale production are Roorkee and Ambala. 75 units were reported to be located at Roorkee and are engaged mainly in the manufacture of surveying, mathematical and drawing instruments. At Ambala 65 units are located and they manufacture various laboratory and electrical instruments and appliances. Manufacture of analytical and chemical appliances is concentrated at Varanasi. The other important centres of small-scale production are Bombay, Poona, Calcutta, Delhi, Dehra Dun, Lucknow, Bangalore and Hyderabad.

It is believed that by 1960 the number of small scale producers had increased to about 300.

Broadly speaking the small units produce the simpler and less precision types of instruments and cater to the requirements of customers who are price-conscious. The types of instruments produced in the small scale sector are generally different in size and specifications from those turned out in the large scale sector. Because of these factors as well as the large demand for instruments in the country, the small scale producers do not seem to face any significant competition from the large-scale sector.

Production.—The production of scientific and industrial instruments in the last 5 years is estimated as follows:

(Rs. in lakhs)

	Production by firms borne on the Development Wing list	Estimated production by units in the small-scale sector	Total
1956	63	35	98
1957	87	46	133
1958	150	68	218
1959	233	77	310
1960	280	90	370

The small-scale producers manufacture, apart from scientific instruments, scientific apparatus and equipment and other items. It is therefore difficult to estimate accurately the value of their production of individual items. The figures for small-scale production indicated above are therefore only approximate estimates.

During the Second Plan period production has registered a four-fold increase rising from about Rs. 1 crore in 1956 to about Rs. 4 crores in 1960. During this period there has been a substantial increase in production of water meters, pressure gauges, surveying instruments and optical instruments. Refractometers, polarimeters, binoculars, microscopes and interferometers are some of the new items taken up for production in the country during this period.

The National Instruments Factory at Calcutta which is the largest unit manufacturing surveying and scientific instruments made considerable progress during this period. The production of this unit which was less than Rs. 16 lakhs in 1955 has been stepped upto almost Rs. 60 lakhs in 1960. Apart from levels, theodolites and compasses, the production of vacuum and pressure gauges and micro-optic theodolites and thermometers has been taken up at the National Instruments Factory.

At present the production of instruments required in schools and colleges up to the B.Sc., standards is almost entirely undertaken in the country. On the other hand, more complicated instruments required in research institutions and industrial instruments are largely imported.

Capital Investment and Employment.—According to the survey conducted in 1958 the total capital investment in the instruments industry including both large and small-scale sectors is estimated at about Rs. 4 crores. The investment in small-scale factories alone amounts to about Rs. 50 lakhs.

The total number of persons employed in the industry is estimated at about 6,000 persons in the large-scale sector and about 2,000 persons in the small-scale sector. The bulk of the persons employed is in the category of skilled and semi-skilled craftsmen.

Imports.—Until September 1957, relatively liberal imports of certain groups of instruments were allowed from soft currency areas. Since September 1957 import quota was reduced drastically for most groups of industries. This generally restricted import policy has been helpful to the indigenous producers in expanding their output to meet the gap created by the reduction in imports.

Imports of instruments are not recorded in sufficient detail in the monthly statistics of Foreign Trade of India. It is therefore difficult to estimate precisely the imports of different categories of instruments in recent years. Apart from imports of instruments individually, they are also imported as part of original plant equipment. Broadly speaking the present imports of all types of instruments are estimated to be of the order of Rs. 10-12 crores per annum.

II. Programme of Development in the Third Plan:

Estimated requirements.—Considering the variety of instruments and the fields in which they find application, it is not easy to make an accurate estimate of their future requirements. Attempts were however made by the Scientific Instruments Committee, the Economic Investigations Branch of the Small Industries Organisation and by the Development Wing to estimate broadly the requirements for major groups of instruments on the basis of the programmes of expansion in technical education, scientific research and industries. On the basis of these studies it is roughly estimated that the annual requirements of scientific instruments for replacement, improvement and expansion in educational institutions including the science

and medical colleges and engineering colleges and polytechnics would increase to about Rs. 15 crores by the end of the Third Plan period. The requirements of industrial instruments are estimated to rise to about Rs. 15-16 crores by 1965-66. Thus the total requirements of industrial and scientific instruments would be of the order of Rs. 30 crores annually by the end of the Third Plan period.

Schemes licensed and under implementation.—Considerable interest has been shown by the existing manufacturers and new entrepreneurs in expanding the capacity for the production of instruments. A number of existing manufacturers have been licensed for substantial expansion. In addition to these expansion schemes, new units also have been licensed. A list of the schemes licensed, the items they would manufacture and their capacities are indicated in the tables at the end of this chapter. Apart from instruments which are already being produced, new types of instruments including those used in industrial process control will be manufactured. It is estimated that the capacity in the private sector will increase to about Rs. 10 crores when these schemes materialise.

The programme in the public sector include the expansion of the Precision Instruments Factory at Lucknow, the expansion of the National Instruments Factory at Calcutta and the setting up of two new precision instruments factories in Rajasthan and Kerala. These are briefly outlined below:

National Instruments Factory, Calcutta.—The more important items of instruments which are at present produced are levels, theodolites, compasses, thermometers, pressure and vaccum gauges and pantographs. The manufacture of optical theodolites in collaboration with M/s. Metrimpex of Hungary has recently been undertaken. An agreement has also been concluded with Japanese firm for the manufacture of clinical thermometers. During the Third Plan period the production of cameras and cinema projector lenses would be undertaken. A technical collaboration agreement has been reached with a Japanese firm for undertaking the production of these items. The development of optics will be another field which will be initiated at the National Instruments Factory. This is important since a number of schemes have been licenced for the manufacture of optical instruments and the optics of the requisite quality should be available for them from within the country. It is estimated that the output of the National Instruments Factory will increase to Rs. 1·5 crores by the end of the Third Plan period.

Government Precision Instruments Factory, Lucknow.—The Precision Instruments Factory at present produces water meters and microscopes. Pressure gauges and blood pressure instruments, technographs and other medical appliances would also be produced in this factory. The current level of production is of the order of Rs. 35 lakhs per annum. During the Third Plan, the capacity for watermeters and microscopes is proposed to be increased. A research-*cum*-design centre would also be set up at this factory. A provision of Rs. 69 lakhs has been made in the Third Plan for the expansion of this factory.

Ordnance Factory, Dehra Dun.—An expansion programme for the production of various types of optical, survey and mathematical instruments at the Ordnance Factory, Dehra Dun, is being drawn up. Consideration is also being given to the development of optics. It is expected that after the expansion programme is completed it will be possible to meet a part of the requirements in the civilian sector for certain types of precision instruments.

New Precision Instruments Factories.—As mentioned earlier the requirements of industrial instruments are expected to increase to about Rs. 15-16 crores per annum by the end of the Third Plan period. The production of process control and indicating instruments involve a high degree of skill and know how. The progress so far made in the manufacture of these instruments has been negligible. In view of the increasing requirements for these types of instruments arising from industrial expansion, it was considered necessary to arrange for the production of these instruments on a large scale. Accordingly the setting up of a precision instruments factory was included under the schemes proposed for USSR aid for Third Plan Projects. On the basis of subsequent discussions with the U.S.S.R. Experts, it has now been decided to set up two Precision Instruments Factories in the Public sector. These will be located in Rajasthan and Kerala. Between them, they are expected to produce a wide range of industrial instruments. It is expected that the bulk of the requirements for industrial process and control instruments required in major industries will be met when these two factories achieve full production.

The first factory to be located at Kotah in Rajasthan will specialise in the production of electro-magnetic and electronic instruments and other items required for completing instruments. Its annual capacity will be for about Rs. 15 crores worth of instruments including the primary elements. The production programme of this factory is indicated below. It is estimated to cost Rs. 8 crores.

Item	Annual output (pieces)	Annual cost (million roubles)
1	2	3
Electro-magnetic indicating & regulating instruments:		
Regulating & pyrometric millivoltmeter	50,000	32·5(3·90)
Various electro-magnetic indicating instruments	50,000	8·5(1·02)
Profile logmeters	20,000	2·8(0·34)
Experimental manufacture of electro-magnetic instruments	..	1·2(0·14)
Automatic electronic instruments indicating, signalling & regulating:		
Electronic automatic potentiometer	5,000	13·0(1·56)
Electronic automatic balancing bridge	5,000	12·0(1·44)
Electronic automatic induction bridge	5,000	12·0(1·44)

1	2	3
Electronic automatic induction instruments with signalling device	2,500	9·0(1·08)
Electronic automatic PH meter	500	5·0(0·60)
Experimental manufacture of electronic instruments	..	4·0(0·48)
Thermocouples & various transmitting elements for completing instruments to be manufactured as per this programme	..	25·0(3·00)
TOTAL	..	125·0(15.00)

(Figures in brackets indicate the value of production in crores of rupees.)

The exact place of location of the second factory at Kerala has not yet been decided. This factory will specialise in the manufacture of hydraulic, pneumatic and mechanical types of industrial process and control instruments. The production programme of this factory is yet to be settled in consultation with the Russian experts.

A special Designing Bureau will be set up as part of these projects which will undertake design and research on new and improved types of instruments and on their application. The planning of the factories would be such as to enable instruments of allied types not specifically included in the programme also being undertaken, if and when required.

Expansion of the small-scale sector.—The production of scientific instruments in the small-scale sector has been increasing fairly steadily during the last 5 years. With the encouragement and facilities extended by the Government, it may be expected that this trend will continue during the Third Plan period. Assuming that the present rate of progress is maintained and assistance afforded to small-scale units for improving quality and methods of production, it may be expected that the production in the small-scale sector might increase to Rs. 2-2½ crores worth of instruments by the end of the Third Plan period.

Targets.—On the basis of schemes already approved in the private and public sectors, the capacity of the industry is expected to increase to about Rs. 23 crores by the end of the Third Plan period. This is exclusive of the capacity available in the small-scale sector.

The bulk of the additional capacity is expected to arise from the two new precision instruments factories projected in the public sector. While it is hoped that at least one of these factories would be completed by the end of the Third Plan period, it may reach its rated output only in the early years of the Fourth Plan period. The training of personnel, the acquisition of skill and the tuning up of the factory would take time. It is envisaged that the overall production of scientific and industrial instruments in the large scale sector would be of the order of Rs. 12 crores in 1965-66.

Raw Materials.—A large number of components and raw materials is required in the manufacture of instruments. Apart from iron and steel and non-ferrous metals such as copper, nickel, chromium, aluminium, zinc, tin etc., special alloys like phosphor bronze, duralumin, nickel silver, stainless steel, tool steels, magnetic alloys, perm alloys are required. Steel castings and forgings, plastic and synthetic materials, ceramic and glass materials, optical glasses are other items required. In addition, various semi-finished and finished products such as sylphones, precision springs and fine filaments, electronic valves and tubes, condensers, resistors, chokes, cables, transformers, microelectric motors etc., are also needed. Several of these items are at present not manufactured in the country and are imported by the instruments manufacturers. With the expansion of the instruments industry it would be possible to set up facilities for the production of some of these items on an economic scale. Certain others are proposed to be manufactured at the new precision instruments factories to be set up in the Third Plan. The manufacture of optical glass has been undertaken at the Central Ceramic Research Institute. Licences have also been granted for the manufacture of permanent magnets. The manufacture of alloys and stainless steels will be undertaken both in the public and private sectors. Schemes have also been licenced for the manufacture of valves, condensers, cables etc. The various other items will have to be provided by supporting subsidiary industries specialising in one or more of the materials or components.

Standardisation.—The types of instruments manufactured are at present decided on the basis of the customers' requirements with the result that the factories are not able to standardise their products. This is not conducive to increasing production at a rapid pace. Instruments which are required in large quantities should immediately be taken up for standardisation with advantage. This is an aspect to which the Indian Standards Institution should devote its attention.

Training & Research.—The instruments industry requires a high degree of specialisation. Skilled workers are required both for the manufacture and maintenance of instruments. The provision of training facilities to ensure the adequate supply of maintenance engineers, technicians, design engineers is therefore of considerable importance, more particularly in view of the large expansion of the instruments industry envisaged in the Third Plan. The Development Panel for Scientific Instruments has expressed the view that the expansion of training facilities in the instruments technology to train maintenance engineers, technicians as well as design engineers would require to be taken up urgently. It has been suggested that this training should be both at graduate and post-graduate level and in both cases apprenticeship system to impart training in the factory atmosphere should be adopted and organised.

Under the Central Scientific Instrument Organisation (CSIO) and with the assistance of the Council of Scientific and Industrial Research, a training centre is proposed to be set up with Swiss Foundation aid at a suitable place in India. This centre will provide practical specialised training to selected craftsmen working in the industry, will afford consultative and advisory service to Indian instruments industry and may also undertake production of selected instruments to help in its training programme. With

the assistance from U. N. special fund amounting to almost a million dollars, a technical centre for design, standardisation and quality control of instruments and for rendering technical assistance to the instrument industry will also be set up under C.S.I.O. Also a proto-type factory with French collaboration is likely to be set up at Guindy to cater for the design requirements of the instrument industry.

Adequate attention would also have to be paid to research and development to keep pace with the rapid advance in technological developments and improvements in the instruments industry. As already mentioned a Special Design Bureau would be set up as part of the Precision Instruments Project envisaged in the public sector. It is necessary that similar facilities for design should be created by the organised industries in the private sector also. In order to assist in the setting up of design cells, it has been decided that manufacturers desiring to set up such design cells will be able to secure financial help up to 50% of their expenses for the formation of the cells from the C.S.I.O. Co-operative effort on the part of the National Laboratories, Central Scientific Instruments Organisation, Research and Development Establishments in the Defence Sector, Technological Institutions and the Instruments Industry could considerably assist in speeding up the progress of the instruments industry.

The following table summarises the programme of scientific and industrial instruments industry in the organised sector during the Third Plan period:—

(Rs. crores)

	1960-61	1965-66
Annual capacity	3.5	23
Annual production	3.0	12

ANNEXURE A

Expansion Schemes Licensed/Approved

Name of the Unit	Types of instruments produced	Annual Capacity	
		Before expansion	After expansion
		(Rs. lakhs)	(Rs. lakhs)
M/s Instruments & Chemicals (P) Ltd., Ambala City.	(i) Scientific & Physiological Instruments etc. (ii) Electronic Medical & Psychological Instruments.	10·2	18
M/s Andhra Scientific Co., Masulipatam.	Optical, Surveying and General Laboratory Instruments.	24	68·6
M/s Bajaj Electricals Ltd., Bombay.	Electrical measuring Instruments, Bridges, Potentiometers etc.	6	16
M/s Associated Instruments Manufacturers (India) Pvt. Ltd., New Delhi.	Soil, Cement, Fuel Testing Instruments etc.	5	10
		Nos.	Nos.
M/s Kohi-noor India Ltd., Varanasi.	Slide Rules	6,000	45,000
M/s Instruments Research Laboratory Ltd., Calcutta.	Microscopes	1,024	2,156
M/s P. Orr & Sons (P) Ltd., Madras.	Theodolite	144	216
	Levels	360	600
M/s Gansons (P) Ltd., Bombay .	Gas Plants, Ovens, Water baths etc.	10	20

ANNEXURE B

New Undertakings Licensed/Approved

Name of undertaking	Types of Instruments	Annual Capacity Licensed/Approved
M/s Pioner Equipment Co. (P) Ltd., Bombay.	Microscopes . .	2,400 Nos.
	Levels . .	1,200 Nos.
	Theodolites. . .	360 Nos.
M/s Bajaj Electricals Ltd., Bombay	Insulation Testers .	4,000 Nos.
M/s Union Commercial & Indl. Co. P. Ltd., Bombay.	Testing Machines .	66 Nos.
M/s Crescent Agencies (P) Ltd., Bombay.	Pressure Gauges .	42,000 Nos.
M/s Kaycee, Industries Ltd., Bombay.	Water Meters ½", ¾" & 1" sizes.	24,000 Nos.
M/s W. J. Alcock & Co. (P) Ltd., Calcutta.	PH Meters and PH Testers.	375 Nos.
	Conductivity Meters Hydriot.	100 Nos.
	Double Cell Ionic Exchangers.	250 Nos.
M/s Shri C. L. Anand, Trivandrum	Water Meters ½" to 1" size.	24,000 Nos.
M/s W. H. Brady & Co. Ltd., Bombay.	Semipositive Water Meters.	1st Yr. 10,000 Nos. 2nd Yr. 15,000 Nos. 3rd Yr. 20,000 Nos.
M/s Amartara Industries, Bombay	Laboratory balances (Micro Balances, Micro single pan & high sensitivity balances).	1st Yr. 500 Nos. 2nd Yr. 700 Nos. 3rd Yr. 2,000 Nos.
M/s Mercantile & Industrial Development Co. (P) Ltd., Bombay.	Deamtor Model 3050	240 Nos.
	Strainer E Type size 6"	240 Nos.
M/s Air-conditioning Corpn., Calcutta.	Fulscope . . .	2,430 Nos.
	Flexotimer . .	270 Nos.
M/s Scientific Engineering House (P) Ltd., Hyderabad.	Surveying Instruments	Rs. 6·15 lakhs
M/s Ram Labhaya Arora & Sons, Calcutta.	Laboratory Platinum ware.	Rs. 12 lakhs

17. RAILWAY ROLLING STOCK

I. Review of Progress in the Second Plan:

Targets.—While formulating the Second Five Year Plan it was proposed to step up the capacity of the Chittaranjan Locomotive Works (CLW) to 300 locomotives and of M/s. Tata Locomotive & Engineering Company (TELCO) to 100 locomotives per annum.

As regards wagons it was estimated that the requirements of wagons would be of the order of 25,000 per annum by 1960-61. The five year production from indigenous capacity was estimated at 87,000 wagons and imports were visualised at 20,000 wagons during the quinquennium.

The number of coaches required during the Second Plan period was originally estimated at about 11,575 or roughly about 2,300 coaches (including some E.M.U. stock) per annum. To fill the gap between the existing installed capacity and the requirements provision was made in the programme of the Ministry of Railways for setting up a Metre Gauge Coach Building Factory to produce 200 coaches per year.

Capacity and Production.—During 1950-51, the year preceding the First Five Year Plan, Chittaranjan produced only seven steam locomotives. At the end of a decade, it has achieved a rate of production of about 168 WG locomotives per year. It has manufactured more than 1,000 boilers so far, for being fitted into the locomotives. Whereas in the earlier years, the output of boilers at Chittaranjan was less than that of the locomotives and boilers had to be imported, it was possible by 1959-60 to fit every locomotive produced at Chittaranjan with its own boiler. The boilers production was thus progressively stepped up along with that of locomotives. During 1958-59 the boiler production was short by 3, but during 1959-60 it was in excess of the locomotives by 5 and by 11 in the following year.

During the period of the two Plans, the imported content of a locomotive has been progressively reduced. During 1951-52, the imported content of a "W.G." locomotive was Rs. 2,46,000 and it came down to Rs. 50,000, in 1960-61. The Chittaranjan Locomotives Factory developed indigenous capacity for supply of various items by making available the technical "know how", by placing educational orders with new firms in the rolling stock field and by supplying the wooden patterns when necessary. Import of components was thus reduced and savings on foreign exchange effected.

The capacity of TELCO stood at 50 locomotives per annum at the end of the First Plan. From the beginning the company was aware that a capacity for 100 locomotives was necessary for economic production and the plant was originally planned for such output. Later on, it was discovered that the Consultants had under-estimated the requirements of machinery and covered area and thus the actual capacity turned out to be less than 100 locomotives. In the year 1956 the company ordered the necessary balancing equipment for carrying out the expansion.

The expansion programme of TELCO's locomotive division was completed in August 1957 and production at the rate of 100 locomotives per year established since September 1957, four months ahead of schedule. The company continues to receive technical assistance from its associates M/s. Krauss Maffei A.G.

The output of locomotives from these two factories has gradually risen during the Second Plan period as indicated below:

Production of locomotives

	CWL No.	TELCO No.	TOTAL No.
1956-57	156	67	223
1957-58	164	85	249
1958-59	165	103	268
1959-60	173	106	279
1960-61	173	99	272
TOTAL	831	460	1,291

There has been a progressive increase in the production of locomotives during the Second Plan period but the target of production of 400 locomotives to be achieved by the end of the Second Plan has not been fulfilled. TELCO was able to achieve its target of 100 locomotives by 1958-59. The expansion of Chittaranjan to 300 locomotives per annum was not taken up since it was felt that the further expansion of CLW would have to be for the manufacture of electric locomotives. The programme relating to the steel casting foundry has been discussed under 'castings and forgings'.

Electric Locomotives.—During 1960-61, the last year of the Second Plan, a start was made at Chittaranjan on the production of 1,500 volts DC electric locomotives for the Central Railway. The first locomotive was turned out in October, 1961. The electrical equipment has to be imported in the initial stages and until the Heavy Electricals Projects develop capacity to meet this demand.

Diesel Locomotives.—Following the decision taken by the Railway Board to extend diesel traction particularly in the steel and coal belt areas of the country, schemes for the manufacture of diesel hydraulic and diesel electric locomotives were formulated by certain private enterpreneurs in 1958. Having regard to the heavy drain of foreign exchange that would be involved in importing these locomotives, their early indigenous manufacture was recognised as important. Following the decision taken in favour of developing the production of diesel locomotives in the public sector, a preliminary project report was prepared by the end of the Second Plan for a scheme designed to manufacture about 150 diesel locomotives per year, by an expert committee set up by the Railway Board. A decision was taken in September, 1961 to locate this plant at Varanasi in Uttar Pradesh. The electrical equipment for the locomotives will be provided by H.E.P. Bhopal.

Wagons.—The installed capacity for the manufacture of wagons at the end of the First Plan stood at 15.179 numbers per annum. During the period of the Second Plan, additional capacity of 10,820 numbers came into production. At the end of the Second Plan, there were 13 units in production with an annual installed capacity of 25,999 numbers of wagons. The Statewise distribution of this wagon building capacity was as follows:

State	Capacity as on 1-4-61 (Nos.)
West Bengal	22,129
Maharashtra	870
Madras	1,000
Bihar	1,000
Rajasthan	1,000
TOTAL	25,999

The actual production of wagons during the Second Plan had been as follows:

	(in terms of 4-wheelers)
1956-57	17,254
1957-58	17,902
1958-59	11,961
1959-60	10,245
1960-61	11,768

The actual production of wagons in 1955-56 was 15,337 (in terms of four-wheelers). There was increase in wagon production in the first two years of the Second Plan. Thereafter the production had started declining. The fall in production of wagons was attributed to inadequate supply of steel. Whatever supplies were received could not also be utilised fully since they did not constitute steel in matched sets as required for production of wagons.

Coaches—The main suppliers of coaches in the public sector are the Integral Coach Factory, Perambur, and the Hindustan Aircraft Factory, Bangalore.

The Integral Coach Factory was set up in the First Plan period with the technical collaboration of the Swiss Car and Elevator Manufacturing Corporation Ltd., Switzerland. The initial capital outlay for the shell

factory was Rs. 7·21 crores and a further sum of Rs. 3·70 crores was provided during the Second Plan for putting up a furnishing annexe. The factory had about 7,800 workers on its payrolls in 1960-61.

According to the Technical Aid Agreement with the Swiss collaborators, the factory was to achieve its maximum production of 550 Coach Shells a year in progressive stages by the fifth year from the start of production. Production was started in October, 1955 and since then year after year the output and the performance have improved. The 1,000th coach was turned out early in 1960 well ahead of the schedule.

The actual production and the targets set, were as follows:

	Revised Target (Nos.)	Production (Nos.)	
1st year (1-10-55 to 30-9-56)	40	43	
2nd year (1-10-56 to 30-9-57)	120	150	
3rd year (1-10-57 to 30-9-58)	240	308	(with partial second shift working).
4th year (1-10-58 to 30-9-59)	350	424	Do.
5th year (1-10-59 to 30-9-60)	350	502	Do.
6th year (1-10-60 to 30-9-61)	350	609	Do.

Quality of the Coaches.—The integral coaches produced in the Perambur Factory are of modern light-weight all-welded steel construction, designed to give maximum comfort and safety to railway passengers. Being seven tons lighter than the conventional coaches of 42 tons, considerable economy is effected in operational costs, as more number of integral coaches can be handled per train, thus reducing over-crowding in trains. Another important feature of this coach is its "antitelescopic end construction". The ends being plastic *i.e.*, designed to carry less stresses and strains, get buckled in the event of an accident, thus absorbing most of the collision energy and reducing the possibility of the carriages telescoping and causing risk to passengers.

M/s. Hindustan Aircraft Ltd., have also switched over to the manufacture of Broad Gauge integral type light-weight coaches which like the coaches built at the Perambur Factory do not require separate underframes. M/s. Jessops & Company are the only manufacturers of coaches in the private sector. They build conventional type coaches which require separate underframes which also are manufactured by the firm. For the coaches manufactured in Railway Workshops, all the underframes required are made by the wagon builders such as M/s. Braithwaites, M/s. K. T. Steel & Company, M/s. Jessops & Company, M/s. Texmaco etc.

Imports and total availability.—It was envisaged that the Railways would make substantial progress during the Second Plan period in clearing the arrears of replacement of rolling stock. With this end in view, the Railway plan originally proposed to place 2,364 locomotives, 107,247 wagons

and 11,575 coaches on the line during 1956-61. As it was not considered possible to obtain the entire requirements from indigenous sources, the following pattern of procurement was visualised:

	1956-61 (Numbers)		
	Indigenous	Imported	Total
Locomotives	1,127	1,237	2,364
Wagons	86,778	20,469	107,247
Coaches	11,575	..	11,575

As against this programme, the actual number of rolling stock procured from abroad and indigenously has been as follows:

	1956-61 (Numbers)		
	Indigenous	Imported	Total
Locomotives	1,291	801	2,092
Wagons (in terms of 4-wheelers)	69,130	28,860	97,990
Coaches (including EMUs and Railcars)	7,332	214	7,546

Imports of the rolling stock in each year of the Plan are given below:

	Locomotives (Nos)	Wagons (4-wheelers) (Nos)	Coaches (Nos)
1956-57	431	18,421	61
1957-58	221	8,990	123
1958-59	102	1,439	30
1959-60	40	6	..
1960-61	7	4	..

Investment.—The Second Plan visualised an investment of Rs. 5·0 crores during the Plan period for the development of the railway rolling stock industry in the private sector. It was also estimated that Rs. 5·0 crores would be invested in the expansion of the Chittaranjan Locomotives Factory, and Rs. 10·0 crores on the expansion of the Integral Coach Factory

and the establishment of Metre Gauge Coach Factory. The actual investment likely to have been made on the basis of the latest appraisal of the position is roughly as follows:

(Rs. crores)

TELCO	1·0
Chittaranjan	1·8
Integral Coach Factory	3·3
Loco. Component Works	1·4
Wagons	1·0
TOTAL	8·5

Cost of Production.—With the increase in the production, the total man-hours spent per locomotive at Chittaranjan have come down from 121,000 in 1953-54 to only 55,000 during 1959-60. The cost of production has been brought down from Rs. 605,000 in 1953-54 to Rs. 410,000 in 1959-60. In spite of the increase in the cost of labour and materials the cost of production remained at Rs. 409,000 per locomotive during the last year of the Plan.

As regards the metre gauge locomotives manufactured by TELCO, the price paid by the Railways for supplies made after 1st April, 1958 was Rs. 3·75 lakhs per unit.

II. Programme of Development in the Third Plan:

Estimated Requirements.—In the Second Five Year Plan, the total originating traffic of the railways was expected to increase from 114 million tons in 1955-56 to 162 million tons in 1960-61 *i.e.*, by about 42 per cent on the whole. Over the period of the first two plans, the volume of freight has increased from about 91 million tons in 1950-51 to 153·5 million tons in 1960-61 *i.e.*, by about 69 per cent. The average lead of traffic has increased during this period from 292 miles to 350 miles, *i.e.*, by about 20 per cent and the volume of freight traffic in terms of ton miles has gone up by 100 per cent *i.e.*, from 27·0 billions to about 53·7 billions. The passenger traffic in terms of passengers originating has increased from 1,284 million in 1950-51 to 1,591 million in 1960-61, an increase of 24 per cent. The rolling stock on line has expanded as shown in the following table:

Rolling Stock in service on 31st March

	1951	1956	1961 Estimated
Locomotives	8,461	9,172	10,629
Coaches (Units)	20,502	23,155	28,009
Wagons (4-wheelers)	222,441	268,493	339,264

The railway development programme in the Third Five Year Plan has been formulated on the basis of the originating traffic reaching a figure of about 245 million tons in 1965-66 *i.e.*, the last year of the Third Plan. The volume of traffic is thus expected to increase over the 1960-61 level by 91 million tons *i.e.*, by about 59 per cent.

In order to cater for the anticipated increases in traffic and also for replacement of overaged stock, it is estimated that the following augmentation of the rolling stock will be required:

	Locomotives (Nos.)	Coaching vehicles (Nos.)	Wagons (in terms of 4-wheelers) (Nos.)
Additions	1,150	5,025	90,447
Replacements	614	2,854	26,697
Total Procurement	1,764	7,879	117,144

In order to meet these requirements, the indigenous production is visualised to make the following contribution during the five-year period of the Third Plan:

(Numbers)

	Broad Gauge	Metre Gauge	Narrow Gauge	Total	
Locomotives					
Steam	840	351	..	1,191	1,470
Diesel	..	..	..	115	
Electric	..	..	..	164	
Wagons (in terms of 4-wheelers).	92,602	21,116	3,426	117,144	
Coaches	3,824	3,685	370	7,879	

Additional Capacity.—The existing capacity for the production of broad gauge steam locomotives at the Chittaranjan Locomotive Works is considered sufficient to meet the demand for these locomotives during the Third Plan.

The Railway Plan provides for the manufacture of electric locomotives at Chittaranjan and diesel locomotives at Varanasi. The electrical requirements of the former and the diesel electric locomotives planned under the latter are proposed to be drawn from the HEP, Bhopal. The investment requirements of these two projects estimated at Rs. 5 crores and Rs. 12 crores respectively form part of the Railways Plan for 1961-66.

BOX Wagons and wagon building programme.—For maximising the transport capacity with the existing installations of track and for handling the increasing volume of goods traffic in future, it is felt necessary that the average load of trains must be increased and that this could be done only

if the average capacity of the goods wagons is increased. The average net train load in U.S.A. is of the order of 1430 tons and in the U.S.S.R. it is 1052 tons as compared with only 613 tons on the B. G. in India. The average capacity per wagon in U.S.A. is 48·6 tons and in U.S.S.R. 60 tons. On the continent, where the average wagon capacity is low the average net train load is in the region of about 450 tons. The British Railways with an average wagon capacity of 15 tons are working with an average net train load of 154 tons only. The result of the smaller average loads of trains in U.K. has been that the percentage of double and more than double track to total mileage is about 65; on the continent, it is of the order of about 42. As compared to this, in the U.S.A. double and more than double track is only 15 per cent of the total mileage, and in India it is of the order of 10 per cent. These comparative figures indicate that from the long term point of view, it is necessary to introduce on the Indian Railways a heavier carrying capacity wagon, if large investments on double and multiple tracks are to be avoided and the volume of goods traffic envisaged in the near future is to be handled. Against this perspective of future trends, the Railways have planned to design and introduce new bogie wagons amongst which the main type is the BOX wagon to carry the heavy mineral traffic *e.g.*, coal, iron ore etc. During the Third Plan, the use of this wagon which can carry 55 tons of coal as compared to 20 tons in the old types is proposed to be extended. The transportation plan is mainly based on the intensive usage of this new wagon. Besides this wagon other bogie wagons for the transport of raw materials for the steel plants, iron ore for export etc., are also envisaged.

Over-aged Stock.—A substantial reduction is expected to be made by the end of the Third Plan period in the percentage of overaged rolling stock to the total on the line as indicated in the table below:

Percentage of overaged stock to total stock on line

As on	Locomotives		Coaches		Wagons	
	Broad Gauge	Metre Gauge	Broad Gauge	Metre Gauge	Broad Gauge	Metre Gague
31-3-51	23·0	31·0	29·5	45·0	13·3	29·4
31-3-56	33·2	25·8	32·3	32·7	18·0	21·2
31-3-61	25·4	19·0	35·6	29·0	10·3	12·3
31-3-66 (anticipated) . .	27·2	18·6	26·8	18·7	11·6	11·4

Schemes under implementation.—Reference has already been made to the schemes for the production of electric and diesel locomotives.

Steel foundry at Chittaranjan.—The Chittaranjan Locomotive Works has taken up the setting up of a steel foundry with a capacity of 7,000 to 10,000 tons of finished castings per annum. This foundry will not only produce the steel castings required for the locomotives and other rolling stock,

but will also manufacture the austentic manganese steel castings, and other intricate castings to meet the requirements of the railway expansion programmes.

Wagons.—There are at present seven schemes under implementation with a capacity of 5,420 numbers per annum. Out of these, five schemes with a capacity of 3,420 numer of wagons have been cleared for the grant of import licence. It will be necessary to reach a capacity of about 33,500 wagons (in terms of four-wheelers) by the end of the Third Plan. Capacity for the production of wagons in railway workshops is also being developed.

Coaches.—Encouraged by the performance in the Second Plan period, the Integral Coach Factory has embarked on a plan to produce 3,723 coaches during the Third Five Year Plan commencing from April, 1961. This programme includes coaches even for the metre gauge electric multiple unit stock and also diesel railcars required for the Indian Railways. It is envisaged that M/s. Jessops & Co., Hindustan Aircraft, Integral Coach Factory and Railway Workshops will produce 4,737 coaches during the Third Plan period.

The following table summarizes the development programme for the Railway Rolling Stock industry:

	1960-61 Capacity	Production in the Second plan period	1965-66 Capacity	Production in Third plan period
Locomotives :				
Steam (average size)	300	1,291	300	1,191
Diesel	..	..	..	115
Electric	..	..	60	164
Wagons	26,000	69,130	33,500	117,144
Passenger coaches (including other coaching vehicles)	1,800	7,332	1,900	7,879

18. SHIP BUILDING

1. Review of Progress in the Second Plan:

Targets.—At the end of the First Plan, the Hindustan shipyard, the country's only ship-building yard in the public sector, had a capacity to deliver two ships per annum. It was envisaged that on completion of the first phase of the development programme, the annual production level of the yard would rise to six ships of the old type or four ships of the modern design. It was also visualised that on the execution of the second phase of development, the shipyard would reach an economic level of production of 8 to 12 ships per annum. The total tonnage expected to be turned out during the Second Plan was placed at 75,000 to 90,000 gross registered tons (G.R.T.).

Progress of development works.—Of the provision of about Rs. 2 crores made for the first phase of development envisaged in the First Plan, there was a spill-over of about Rs. 56 lakhs into the Second Plan. The works included in this phase have almost been completed.

In regard to the second phase of development, although a provision of Rs. 1 crore was made in the Second Plan, the shortage of foreign exchange led to the curtailment of the programme to a certain extent. As a result, the following works costing about Rs. 72·2 lakhs only have been undertaken during the Second Plan period.

	(Rs. lakhs)
Houses for workers	22·50
Officers' houses	3·00
Water supply arrangements	14·00
Essential machinery	7·67
Extension of the jetty	25·00
TOTAL	72·17

The above works except for the extension of the jetty have almost been completed by the end of the Second Plan period.

Dry dock.—A project for the construction of a dry dock at Vishakhapatnam at a total cost of Rs. 215 lakhs was sanctioned by the Government as early as 1955, but only Rs. 1 lakh was spent on it during the First Plan period. Provision, therefore, was made for the balance of Rs. 214 lakhs in the Second Plan. The execution of this project had to be postponed consequent on the reappraisal of the Second Five Year Plan as a result of the difficulties of foreign exchange. There was, however, an expenditure of about Rs. 5·3 lakhs for payment towards fee for technical consultants and for other preliminary works *viz.* soil investigation, diversion of anti-malarial drain etc.

Subsidy.—When compared with the major producers of ships like United Kingdom, Germany and Japan, the cost of ship building in India is high. With a view, therefore, to ensuring that the Indian shipowner does

not have to pay an uncompetitive price, the Government have accepted the principle of selling the ships built at the Hindustan Ship-Yard at the 'U.K. parity price'. According to this arrangement the Shipyard accepts from the buyer the approximate price he would have paid for a similar ship built in U.K. The difference between the cost of construction of the ship and the price paid by the buyer is reimbursed to the Yard by the Government as a subsidy. The amount of subsidy works out at present to approximately 26% of the cost of construction of the ship.

In the Second Plan a sum of Rs. 500 lakhs was provided for payment of subsidy to the Yard. As a result of review during 1958 this provision was reduced to Rs. 485 lakhs. The actual amount of subsidy sanctioned by the Government in each year of the Plan was as follows:

	(Rs. lakhs)
1956-57	90·00
1957-58	56·27
1958-59	97·86
1959-60	95·00
1960-61	134·88
TOTAL	474·01

Preliminary work relating to the establishment of the Second Ship Yard.— An inter-departmental Committee was appointed in December 1956 to assess the requirements of ships to be built each year and to decide on the specific types of ships and the total output for which a new shipyard should be planned. According to the Committee's assessment, the aggregate capacity of the Hindustan Shipyard and the new shipyard should be about 120,000 gross tons per annum and the second shipyard should be planned for an initial capacity of 60,000 G.R.T. with a provision for increasing it to 80,000 tons a year.

Regarding the type and size of ships to be built in the second shipyard, the Committee were of the view that the country's primary and minimum requirement is for ships of 9,000 to 12,000 tons deadweight (D.W.T.). Therefore, they recommended that the berths in the new shipyard should not be less than 550 ft. in length and should also include one or two berths of 600 to 625 ft. in length of which at least one should be capable of being extended to 750 ft. in length and 130 ft. in breadth suitable for the construction of merchantships and tankers.

Further to advise on the establishment of a second shipyard, the services of a technical mission were obtained by the Government of India under the Colombo Plan. The U.K. Shipyard Mission visited the country in 1957 and submitted its report in the following year. The Report of the Shipyard Mission was examined by an inter-departmental committee, which went into the relative merits of the sites examined by the Mission and recommended that the shipyard should be located at Cochin.

For the preliminary work connected with the setting up of the second shipyard *viz.* the training of personnel, the selection of an appropriate site for the yard etc., a provision of Rs. 75 lakhs was made in the Second Plan.

While making a review of this provision, the idea of having a separate scheme for training of technical personnel for the second shipyard was given up and it was decided that the training school of the Hindustan Shipyard at Vishakhapatnam should train men for its requirements only. Although this lumpsum provision of Rs. 75 lakhs was revised downwards in 1958, it was increased again to Rs. 51·3 lakhs in 1960 for meeting the cost of acquisition of a portion of land for the Cochin Shipyard. As against this, a sum of Rs. 21 lakhs is estimated to have been spent during the Second plan period.

Achievement of capacity and production.—The capacity of the Vizagapatnam yard as in August 1955 was 15,000 to 20,000 D.W.T. Since then, the capacity in terms of tonnage has been increased to 25,000 to 30,000 D.W.T.

As against the expected production of about 75,000 to 90,000 G.R.T. during the Second Plan period the actual output was of the order of 52,300 G.R.T. The total number of vessels built during this period was 13 which included 8 ships of the maierform design, one lubecker type, one passenger-*cum*-cargo vessel, one survey vessel for the navy and also a motor launch and a tug delivered to the land customs department and Madras Port Trust respectively. The yearwise production since 1956-57 was as under:

	Number of Ships	G.R.T.	Production D.W.T.
1956-57	2	9,800	15,300
1957-58	5*	16,100	19,500
1958-59	1	4,600	7,200
1959-60	4	15,100	17,600
1960-61	1	6,700	9,500
TOTAL	13	52,300	69,100

*Includes a motor launch and a tug.

It will be observed that the production in terms of tonnage has been about 14,000 D.W.T. per year on an average. In terms of ships built, the average comes to 2·6 ships per annum. The decrease in production in 1958-59 is on account of certain adjustments which became necessary consequent on Indian personnel taking over from the French technicians, and the time taken to settle the specifications for three ships then under construction.

Capital and labour.—The total issued and paid-up capital of the company, which was of the order of Rs. 452·75 lakhs at the end of the First Plan stood at Rs. 559·67 lakhs as on 31st March, 1961. Of this, shares of the value of Rs. 455·42 lakhs were held by the Government of India and the remaining shares of the value of Rs. 104·25 lakhs were held by the Scindia Steam Navigation Company. The question of repatriation of Scindia's capital is, however, under consideration of the Government.

The total number of persons employed in the shipyard at present is about 4,400, which is exclusive of the apprentices in the training school numbering 268.

Raw materials.—Only about 22 to 30 per cent of the materials used in the construction of a ship are of indigenous origin. The important machinery and equipment are being imported and of these, the propelling machinery is the largest single order for each ship. As regards steel, which is the most important item of material for ship building and ship repairs, in view of the limited size and quantity of plates available in the country, current requirements are being met by imports. With the availability of shipbuilding steel in exact sizes and quantities required by the yard from the Rourkela Steel Plant, there will be a cut in imports resulting in appreciable reduction in the cost of construction of ships. Another major item required by the industry is timber which is used for sheathing decks, awnings, hatches, ceilings, and bulk heads, sparrings, cabin partitions etc. It has been possible to eliminate virtually the need for import of all types of timber except oregon pine. A Himalayan specie called the blue pine has proved to be a satisfactory substitute for oregon pine.

Other developments.—A design and estimating section was constituted as a part of the reorganisation of the technical set-up of the yard in March 1959. It is now engaged in preparing a few trial designs for certain types of vessels for which there is likely to be demand in the future.

In order to achieve better efficiency in all the work centres of steel and outfit departments, "machine load curves" (*i.e.*, preparing the load on each machine and marking the realised figures on the chart) and "crane activity" charts have been adopted as recommended by the National Productivity Council.

A new section was created in the Planning Department for the purpose of establishing norms in regard to production. This section has made good progress with regard to collection of data which has been usefully adopted in the shipyard.

Attempts are also being made to conduct "time study" in certain operations with a view to achieving better cost control.

As a result of adoption of the above methods the rate of man-hours per ton of steel processed in the hull shop, prefabrication and erection departments has registered a steady decline. Similarly the rate of man-hours for precessing every hundred rupees worth of materials (other than steel) handled in the outfit departments has also been going down since 1957-58.

Problems and experience.—One of the main difficulties faced by the Hindustan Shipyard especially during the later part of the Second Plan was the lack of sufficient orders for ship building. The present outlook is, however, better and the shipyard has in hand orders for nine ships of the "Mitsubishi" type. Nevertheless in view of the high cost of construction of ships the primary objective of the yard should be for improving efficiency and bringing down costs and this would have to be achieved by better planning, management and execution. The indigenous production of materials and equipment required by the ship building industry will also go a long way to bring down the cost of production of ships.

The difficulty in obtaining the required quantity of steel both imported and indigenous in time has been greatly affecting the proper execution of orders placed with the firm. The steel supply position is, however expected to ease when the Rourkela Steel Plant goes into regular production of ship building steel.

With regard to pricing, experience has shown that the correct ascertainment of the U.K. parity price and its adaptation for fixing the price to be paid by the Indian shipowners has been a complex matter. Under the present arrangement, fixation of price of a ship has tended to become a matter of bargaining between the shipyard and the shipowners. The shipowners have contended that the U.K. parity price may not be the representative ruling world price of a vessel and have therefore demanded that the ships built in the yard be made available at the lowest world price. This demand of the shipowners would present the same difficulties as those encountered in the operation of the U.K. parity price.

II. Programme of Development in the Third Plan:

Estimated requirements of tonnage.—It is expected that about 57 ships with a total tonnage of 3·75 lakh G.R.T. would be acquired to meet the requirements of the coastal and overseas trade during the Third Plan period. Of this total tonnage, about 194,000 G.R.T. is estimated to be required for replacement of obsolete ships and the balance of 181,000 G.R.T. will be available for addition to existing tonnage. This will raise the availability of total tonnage to 1·1 million G.R.T. by 1965-66. The following table gives the break-up of the tonnage proposed to be acquired during the Third Plan.

Total Shipping tonnage expected to be acquired in the Third Plan:

	Total tonnage (G.R.T.)
Coastal	
Replacement	100,000
Addition	32,500
TOTAL OF COASTAL	132,500
Overseas	
Replacement	93,600
Addition	148,400
TOTAL OF OVERSEAS	242,000
TOTAL OF COASTAL AND OVERSEAS	374,500

Target of capacity.—It is envisaged that with the completion of the second phase of development, the building capacity of the Hindustan Shipyard would be raised from its present capacity of 2½ to 3 ships or about 25,000 to 30,000 D.W.T. to 4 ships or about 35,000 to 40,000 D.W.T. per

annum. Further the Hindustan Shipyard is expected to reach its optimum capacity of 6 to 8 ships or 50,000 to 60,000 D.W.T. per annum on the completion of the development works included in the Third Plan.

Programmes

(1) *Development of the Hindustan Shipyard.*—The major development works envisaged are the extension of the two existing bays and the construction of a third bay in the new hull shop, extension of the 35 and 45 ton crane tracks towards the water front, extension of berths 1 and 2 towards water front, extension of the jetty, replacement of machinery and additions in the shops including cranage. Improvement of the social welfare and other amenities and extension of housing in the colony are also among the major items of work expected to be undertaken during the Third Plan Period.

(2) *Dry dock.*—In view of the urgent need for construction of a dry dock as an important adjunct to the shipyard, the dry dock project is included in the Third Plan. As discussed earlier, this project is virtually a spill-over from the Second Plan.

The dry dock is of prime importance in all cases in which major surveys or under-water repairs are to be carried out. The provision of the dry dock will avoid the necessity of the ships built at the Hindustan Shipyard having to sail to Calcutta for dry-docking before delivery as at present. Besides stimulating the development of a good ship repair industry and thus enabling the shipyard to reduce its overheads in the construction of ships, it can earn foreign exchange in so far as its services are made available to foreign owned ships.

With the completion of the above two programmes of development, the Vishakhapatnam Shipyard will be capable of producing ships of a total tonnage of 50,000 to 60,000 D.W.T. per year.

A new shipyard at Cochin and a scheme for the manufacture of diesel engines also form part of the programmes included in the public sector which are discussed below.

Second Shipyard.—It has been decided to set up a second shipyard at Cochin at an estimated cost of about Rs. 20 crores and the project has been included in the Third Plan. Since it is not likely to go into production before the end of the Third Plan, no provision for payment of subsidy to the new yard has been made in the Plan. The early implementation of the scheme depends on finding a specific foreign source to provide the whole or part of the foreign exchange requirements and to collaborate in the project. Certain offers have, however, been received from established ship building firms in U.K., Germany and Japan and they are under examination.

Marine diesel engine project.—As an important step in the direction of attaining self-sufficiency in components and parts required for construction of ships, the establishment of a marine diesel engine project has been engaging the attention of the Government for quite some time. There was a proposal for inclusion of a scheme in the Second Plan for the manufacture of marine diesel engines in the public sector. Pending the examination of the

economics of the project, the inclusion of the scheme in the Second Plan was agreed to in principle; and it was stated in the Plan that the resources required for it would be provided at the appropriate stage. Seven firms of international repute were invited to submit preliminary reports for putting up a marine diesel engine plant on technical collaboration basis. Out of these, three firms submitted their project reports in 1957. At the time of the rephasing of the Plan it was, however, decided to defer further action on this project.

Now in view of the increased demand for marine diesel engines stemming from the Hindustan Shipyard and also the second shipyard, the establishment of which also forms part of the programme envisaged in the Third Plan, the need for processing the marine diesel engine project was accepted and it has been included in the Third Plan. On the basis of a capacity target of 50,000 to 60,000 D.W.T., (the optimum capacity of the Hindustan Shipyard by the end of the Third Plan) the annual requirements of the marine diesel engines including those required for auxiliaries have been estimated by the Development Wing at 75,000 to 80,000 B.H.P. With a view to making an economically viable diesel engine manufacturing unit, it has been found necessary to bulk the demand for diesel engines for ship building with the miscellaneous demands arising from programmes for other applications, principally diesel generating sets. The ancillary demands as well as the demand for auxiliary engines under ship building would be for units of capacity generally below 1,000 H.P., whereas that for marine diesel engines required for propulsion of ships would be for ratings of 8,000 to 10,000 H. P. In view of the fact that will take some time before sufficient offtake for diesel engines of higher ratings could be provided by the ship-building industry, it has been decided that the investment on the project and the manufacturing programme thereunder might in the initial years be restricted to the manufacture of auxiliary diesel engines for ships and diesel engines required for shovels, earth moving equipment etc. It is visualised that the production of heavy marine diesel engines of 5,000 H.P. would synchronise with the development of peak demands from the shipyards.

The total investment on the above projects included in the Third Plan and the foreign exchange component thereof have been estimated as under:

(Rs. crores)

Projects	Total investment	Foreign exchange component
Expansion of the Hindustan Shipyard, Vishakhapatnam:—		
Expansion and subsidy	10·00	1·5
Dry dock project of the Hindustan Shipyard	2·00	0·5
Second Shipyard, Cochin	20·00	5·0
Marine diesel engine project	3·00	1·5
TOTAL	35·00	8·5

19. AUTOMOBILE AND ANCILLARY INDUSTRIES

AUTOMOBILES

1. Review of the Progress in the Second Plan:

Targets.—At the beginning of the Second Plan the installed capacity of automobiles stood at 30,000 numbers per annum on single shift basis. No further expansion in the capacity was envisaged during the period of the Plan. It was estimated that the manufacturers would be able to increase indigenous content of their vehicles from the then level of 20-25% to 80%, while production of cars, jeeps, station wagons and commercial vehicles would increase from 23,100 numbers to 57,000 numbers by 1960-61.

Capacity.—The progress in the creation of installed capacity has to be measured in terms of (a) the number of automobiles that could be produced per year on the basis of double shift operation, and (b) the indigenous content of the vehicles manufactured. In their study in 1959, the Technical Committee of the *Ad hoc* Committee on Automobile Industry assessed the installed capacity of the industry with reference to the production which could be expected from the different units on the basis of the best utilisation of their resources as follows:

	Annual capacity (Nos.)
Cars	20,000
Commercial Vehicles (Buses and Trucks)	28,000
Jeeps and Station Wagons	5,500

Since then there has been no material change in the effective installed capacity.

As regards the progress made in increasing the indigenous content, the *Ad hoc* Committee was of the view that the best method of measuring progress would be to take the ex-factory price of the complete vehicle in built up condition in the country of origin and express the ex-factory price of the components which are still being imported as a percentage thereof. The achievement of the different vehicle manufacturers upto 1960 can perhaps be best reviewed by quoting relevant extracts from the 'Report of the *Ad hoc* Committee on Automobile Industry'—

> "The Hindustan Ambassador is undoubtedly the leader in this field. Even in 1950-51 the important components of the engine, transmission and axle were made by Hindustan Motors. Castings for cylinder blocks, cylinder heads, etc., were of indigenous origin while forgings were being imported and machined. At the time of the first Tariff Commission enquiry the indigenous content was in the neighbourhood of 45 per cent. By the time of the second Tariff Commission Enquiry, *viz.*, in 1956, the indigenous content had gone

up to 56 per cent and today on the assessment made by us, it is a little above 70 per cent. They have in fact made all the components which an automobile manufacturer normally produces, except that in respect of body panels they are only making certain panels and not others. The further progress in increasing the indigenous content of the Hindustan Ambassador will depend mainly on the development of ancillary industries and Hindustan Motors themselves have a relative small contribution to make."

"The Fiat 1100 was approved in November, 1953, for manufacture and the programme submitted to Government by Premier Automobiles aimed at the completion of the manufacture of the engine, transmission and axles by the end of 1956. At the time of the second Tariff Commission Enquiry in 1956, the items (apart from tyres, tubes, batteries etc., which were bought from other industries) which Premier Automobiles were making were the fuel tank, silencer assembly, and the radiator for a limited number of vehicles. Their present position on our assessment is that the vehicle is 47 per cent indigenous. They are, therefore, very much behind schedule. They have, however, placed orders for the plant and machinery necessary to make the remaining items which were included in their programme of manufacture. Part of the machinery has already been installed."

"Messrs Standard Motors had begun in September, 1953 with the Standard Vanguard and they got approval to the manufacture of Standard 10 in October, 1954. In both cases the programme aimed at the completion of the manufacture of the engine, transmission and axle by the end of 1956. At the time of the Tariff Commission enquiry in 1956, they had made some components such as, water pumps, valve guides and fuel tanks and were machining cylinder heads and blocks for the Standard Vanguard. They had made little progress with their Standard 10. Subsequently their production of Vanguard has been discontinued and they have achieved 32·5 per cent. indigenous content in respect of Standard 10. They have placed orders for additional machinery and they have also developed foundry capacity in a subsidiary unit. Their progress has been the slowest."

"Turning to the Jeep, Messrs. Mahindra Mahindra had got their programme approved in June, 1954. It was their intention to manufacture the engine, transmission and axle by the end of 1958. At the time of the Tariff Commission enquiry they had made little progress but now they have achieved 65 per cent. indigenous content. The equipment for their completion of their programme has already been installed though they have yet to go into regular production of axles. This, we understand, was due to the delay in getting furnaces."

"Turning to trucks, the Dodge truck of Premiers had number of indigenous items including leaf springs, propeller shafts, cylinder assembly, etc. even in 1950-51. In September, 1953, following the

first Tariff Commission enquiry, they got approval to their programme of manufacture which contemplated completion of the manufacture of engine, transmission, axles etc. by the end of 1956. At the time of the second Tariff Commission enquiry in 1956, the important components of the engine and gear box had been completed but the axle had yet to be developed. Much of their investment in the engine programme has however been a waste because the consumer demand has gone over to diesel engines and the Defence Ministry is also not likely to go in for their petrol trucks. Their present indigenous content is 68 per cent, but this takes account of the diesel engine supplied to them by other manufacturers. The two diesel engines produced independently in the country have themselves varying degree of indigenous content. However, so far as Premiers are concerned, since they have been asked to buy their engines from other manufacturers, it is but appropriate to treat the engine as indigenous in assessing the progress made by Premiers."

"The Tata-Benz trucks of Telcos were approved in 1954 with a manufacturing programme which aimed at the engine, transmission gear box and axles being made in India by the end of 1959. The first phase of their manufacturing programme was to commence in 1955. They had made little progress at the time of second Tariff Commission enquiry but they have developed production of all the items which they had undertaken to produce in India by the end of 1959 according to their original schedule of manufacture. Their performance has been equal to their promise."

"The Leyland Comet of Ashok Leyland was approved for manufacture in 1954 and the programme was to make the important components in India by the end of 1959. They have, however, achieved an indigenous content of 38·5 per cent. only according to our estimation. Part of the delay was due to a complete reorganisation of the Company's capital structure which became necessary for certain reasons and caused a major dislocation of their programme. The machinery required for the programme has however been fully ordered and the programme should be completed in another twelve to fifteen months."

"Bedford trucks were taken up by Hindustan Motors only in 1958 when they abandoned the Studebaker programme which they had started with. The machinery for the chasis, transmission and axles has been ordered in full and they have just started production of the chasis frame."

Since the publication of the Report of the *Ad hoc* Committee all the firms have made further investment on plant and machinery and have been able to achieve a further indigenous content in their respective vehicles ranging from 10 to 15 per cent.

The foreign exchange difficulty has been an important factor which impeded progress of the industry. The impact of this shortage was recognised in the Report on the Reappraisal of the Plan, in May, 1958. It was

estimated in the Reappraisal that by the end of the Second Plan, most of the manufacturing programmes would have made further progress and the indigenous content stepped up in relation to the total output value of the vehicles produced in the last year.

The state-wise distribution of the licensed capacity on double shift basis is as follows:

State	No. of units	Cars (Nos.)	Jeeps (Nos.)	Commercial vehicles (Nos.)
Maharashtra	2	7,200	5,500	7,000
Bihar	1	..	..	12,000
Madras	2	3,000	..	3,000
West Bengal	1	10,000	..	6,000
TOTAL	6	20,200	5,500	28,000

Production.—The expansion of output of automobiles has been adversely affected by the shortage of foreign exchange for both the import of the required capital machinery and the import of components on the scale required. In contrast to a slightly rising trend in the first two years of the Plan, production dropped considerably in 1958 due to severe cuts in foreign exchange allocations. The maintenance of production in the field of commercial vehicles was largely facilitated by the assistance received from the DLF. Statistics relating to the production of different types of automobiles from 1955 onwards are given below:

Indigenous production of automobiles

(Numbers)

	1955	1956	1957	1958	1959	1960	Target under the Second Plan
Cars	10,266	13,666	12,211	8,113	11,993	19,096	12,000
Commercial Vehicles (trucks & buses)	9,493	14,143	16,248	14,557	19,099	27,518	40,000
Jeeps	3,325	4,329	4,599	4,118	5,376	5,501	5,000

It will be seen that in the case of cars and commercial vehicles a considerable increase in production has taken place after 1958. This increase is attributable to the fact that the indigenous content in the vehicles has been steadily increasing, and the foreign exchange position also somewhat improved with the assistance from the Development Loan Fund, USA. The industry has been able to cross the production target of cars and jeeps; but in the case of commercial vehicles, there has been a shortfall.

Imports.—The import of vehicles in completely built up form is not permitted in terms of the import policy. Only the manufacturers are allowed to import the different components required to assemble into a complete vehicle. The number of components imported is being reduced in step with the progress in indigenous manufacture of components by the producers of vehicles as well as ancillary industries. The value of imports as also the number of vehicles imported since 1956 are given in the statement below. It will be seen from the statement that a limited number of venicles has been imported in built-up form. These have been mostly imported as personal baggages by Indian Nationals returning home and by diplomatic missions as also for some special purposes.

Import of Vehicles

	1956		1957		1958		1959		1960	
	No.	Value (Rs. lakhs)	No.	Value (Rs. lakhs)	No.	Value (Rs. lakhs)	No.	Value (Rs. lakhs)	No.	Value (Rs. lakhs)
Cars:										
Complete	712	49·15	314	26·10	372	32·95	232	23·03	107	10·30
Knocked down condition	9,119	447·14	9,737	419·37	7,599	221·52	6,331	188·72	2,659	78·23
Motor, Omnibuses, Vans, lorries etc.	8,608	83·77	16,756	1456·42	13,627	918·31	10,483	665·41	629	40·79
Jeeps . .	..	..	2,043	106·08	548	46·08	2,996	183·9	112	13·15

Exports.—The industry is yet to develop an export market. Some of the trucks have however, been exported to Ceylon in the last year of the Plan.

Fixed Investment.—On the basis of the analysis of the balance sheets, the addition to gross fixed investment made during the first four years of the Second Plan by the six leading companies with approved manufacturing programme for automobiles (Hindustan, Premier, Telco, Standard, Ashok Leyland and Mahindra) is placed at Rs. 17·8 crores. Another Rs. 10 crores is estimated to have been invested in the last year of the Plan. The fixed investment made in the industry by the end of the first plan, by the above six automobile manufacturers was of the order of Rs. 7·4 crores. Thus the total fixed investment made under this industry during the period of two Plans would amount to about Rs. 35·2 crores.

The estimated addition to gross fixed investments made under ancillaries (including Simpson) and allied industries manufacturing motor cycles, scooters and three-wheelers, is placed at about Rs. 6 crores for the period of the Second Plan.

Cost of Production.—The cost of the vehicle manufactured in India is higher than that of similar vehicles produced in the country of origin. The price which an automobile manufacturer in this country has to pay for bought-out components and raw materials has been found to be higher than in the country of origin. It was estimated by the *Ad hoc* Committee on Automobile Industry that the price of Hindustan Ambassador is 38% higher than the consumer price of the Morris Oxford, which is its counterpart in the U.K., after eliminating the incidence of taxation in either case. In the case of Tata Benz truck, Indian price is 12 to 15 per cent higher than the selling prices in Germany.

The factors responsible for the higher costs in India are stated to be as follows:

The equipment installed were for limited capacity. The majority of the automobile factories did not equip themselves with the machinery which is either well-balanced or capable of a large turnover. Many of the raw materials are available to the Indian automobile producer at higher prices than those paid by the counterparts abroad.

The industry has yet to pay adequate attention to technical supervision and control.

There appears to be scope for reduction of current costs by raising productivity per unit of investment, and productivity per man-hour employed and by evolving inter-changeability and standardisation of parts and increasing the scale of operation.

Quality of the product.—The quality and performance of the vehicle manufactured in the country are considered to be fair. It has been felt that a Cooperative Research and Development Centre be established so that all the units could enjoy the benefits flowing from it. This incidentally would infuse greater confidence in the minds of the public as to the quality of the products of the industry

The Indian Standards Institution has set up a sectional committee for automobile vehicles in its Engineering Division. The members of the sectional committee include leaders of industry, representatives of Government departments, technologists and the more important user interests. The Electro-Technical Division Council of the Indian Standards Institution has a separate sectional committee for automobile electrical equipment.

Prices.—With the demand for vehicles in excess of available supplies, a system of informal price control exists. A scrutiny is being made of all proposed increases in price and such increases were allowed only after Government were satisfied that there had been an actual increase in costs.

The *Ad hoc* Committee on Automobiles recommended that price control over commercial vehicles be abolished and an *ad hoc* cut in the price

of cars and jeeps amounting to Rs. 200 to Rs. 500 should be made applicable four months after import licences have been given to enable the manufacturers to keep production at the highest possible level. Government gave careful thought to this recommendation of the committee and the considerations on which it was based. It was however, felt that once production increased substantially and the shortage eased, decontrol of prices would be desirable; but so long as a shortage prevailed, decontrol of prices of commercial vehicles was likely to lead to abuses.

Problems of the industry.—The most important problem faced by the industry during the Second Plan period was shortage of foreign exchange. One of the results of foreign exchange crisis was the drastic fall in the level of domestic production in 1958, which led to conditions of extreme shortage.

The industry faced difficulty in obtaining forgings, castings and stampings from external sources. It is expected that sufficient indigenous capacity will be established by the latter part of 1962 to ensure supplies on the scale required.

The industry also suffered from the shortage of internal finance with the result that the progress in the development of indigenous content of vehicle suffered a setback and all the units could not complete their phased programme in accordance to the schedule submitted by them to the Government.

Another factor which hampered progress has been the steady change in the pattern of demand. Programmes which were first taken up for the manufacture of large American type cars and for making trucks driven by petrol engines has later to be abandoned because popular demand shifted towards small cars and diesel trucks.

AUTOMOBILE ANCILLARY INDUSTRY

1. Progress during Second Plan :

The ancillary industry has made substantial progress and established the production of a number of new items of components thereby rendering valuable contribution to the automobile manufacturers. On account of the development of the ancillary industry various components which were imported in 1959 became available indigenously; in respect of certain components such as leaf springs, brake linings, pistons, fuel injection equipment, though production has commenced, it has not been adequate. The production programmes for a number of components have been approved and these are likely to bear fruit by 1962-63. Some important items under this category are starter motors, dynamoes, wheels & rims and brake systems. It is expected that with the commencement of production of these items most of the components necessary for fitment as original equipment as well as for the spare's market would be available indigenously.

Production.—Whereas the annual production at the beginning of the First Five Year Plan was less than Rs. 50 lakhs in value the current production is well over Rs. 10 crores. The production during the period of the Second Plan was as follows:

	(Rs. crores)
1956	2·30
1957	3·20
1958	5·00
1959	7·50
1960	9·00

The important components turned out and their numbers are shown in the following table:

	1956	1957	1958	1959	1960
Item manufactured					
Pistons	132,042	192,216	203,356	263,213	294,968
Piston Rings	1,917,762	2,162,484	2,381,316	5,199,708	5,979,197
Cylinder Liners	65,177	75,775	83,327	109,535	100,768
Gudgeon Pins	133,326	159,312	173,924	240,422	257,305
Fuel Injection Equipment					
(i) Elements		50,169	168,073	128,134	291,312
(ii) Delivery Valves		78,061	134,657	108,660	289,361
(iii) Injection Pumps		20,934	36,324	60,297	89,800
(iv) Nozzles		40,643	133,692	110,765	389,543
Spark plugs	531,884	369,401	736,251	885,503	1,107,789
Valves		38,484	56,459	290,743	514,568
Shock Absorbers		8,185	13,093	22,773	62,409
Radiators		14,419	12,444	23,071	34,765
Brake Assemblies					
(i) Hose Assemblies			39,523	32,827	230,179
(ii) Master Cylinder Kits			21,568	69,420	
(iii) Wheel Cylinder Kits			29,587	63,891	
Brake Linings (Ft.)		451,387	664,965	1,023,017	309,961
Clutch Assemblies					
(i) Cover Assemblies			254	2,013	58,648
(ii) Driven Plate Assemblies			8,521	26,833	
Gaskets		112,065	3,215,128	6,091,598	9,899,763
Clutch Facings of Discs		43,910	63,197	143,838	179,878
Automotive Diesel Engines		3,333	4,255	8,707	10,065

Employment.—At present the industry provides employment to over 30,000 persons. It includes the number of persons employed in the ancillary units as well.

II. Programme of Development under Third Plan:

Estimated Demand.—The criterion for determining the targets of assembly production of different types of automobiles is obviously the demand. In the past targets worked out on this basis have had to be reduced on account of the limiting factor of the availability of foreign exchange.

The demand for automobiles arises from two sources—replacement demand which is relatively easy to estimate and new and net demand the estimate of which is beset with many difficulties that vitiate the accuracy of projections to some extent.

In its report, the Tariff Commission had indicated about 8 per cent replacement per annum for motor cars on the basis of a 12-year life and about 10 per cent replacement per annum for commercial vehicles on the basis of a 10-year life. There is no reliable data to indicate the vehicles actually scrapped from year to year but in U.S.A. where such data are collected it has been found that the vehicles scrapped during the period of 10 years from 1947 to 1956 worked out to 6·8 per cent per annum in the case of cars and 6·2 per cent per annum in the case of trucks in each year. But in the Indian conditions the wear and tear is much more due to uneven roads and maintenance being not to the standard. Taking all factors into account it is estimated that the life of a bus or truck could be taken at about 10 years and of cars, jeeps and station wagons at 15 years.

As regards the new demand there can be no correct yardstick to determine what will be the requirements in 1961-66. Growth of population, expansion of agriculture and industry and levels of alternative transportation facilities, expansion of national highways and feeder roads, are important factors which have to enter into the assessment of requirements in the coming years.

Taking all the above factors into consideration as well as the likely availability of foreign exchange, it is estimated that the demand for cars will increase from 19,000 to 30,000 numbers, of commercial vehicles from 28,000 to 60,000 numbers and jeeps 5.500 to 10,000 numbers by the end of the Third Plan.

The *Ad hoc* committee on automobile industry has also suggested that the requirements would be met adequately if the following capacity targets are achieved by the end of Third Plan:

Cars	30,000 Nos. (without the introduction of a low cost car).
	40,000 Nos. (with the introduction of a low cost car).
Commercial vehicles	60,000 Nos.
Jeeps	10,000 Nos.

The recommendations of the *Ad hoc* Committee on the targets have been accepted for the Third Five-Year Plan, exclusive of the low cost car whose techno-economic aspects have been remitted to a committee with reference to the feasibility of its manufacture at a price of about Rs. 5,000 (ex-factory without excise).

Capacity in the Public Sector

Commercial vehicles.—With a view to utilising the skilled technicians and the surplus capacity, the Ordnance Factories have embarked upon the production of trucks in the public sector. It is estimated that the civilian sector can reckon upon supplies of 4,000 commercial vehicles per year from the Defence establishments.

The *Ad hoc* Committee appointed by the Government of India to examine the feasibility of producing a low cost passenger car within the price range of Rs. 5,000 to Rs. 7,000 came to the following conclusions:—

(a) There would be sufficient demand to sustain the economic production of a low cost car, without jeopardising the production programmes already approved.

(b) There is little prospect of any of the passenger cars at present being produced coming down to the price range of Rs. 5000 to Rs. 7000 indicated in the terms of reference to the Committee. It is doubtful if economies of this order could be achieved even if the entire machinery in these factories are changed and the production programme made very much larger.

(c) To have a cheaper car, therefore, a more modest vehicle will have to be chosen and its manufacture will need to be started from the very beginning with the latest machinery to ensure economic production.

The Committee had before it a number of proposals in this behalf from various producers but only five of them were reasonably complete proposals relating to cars of acceptable standards and not the so called miniature or bubble cars. The Committee which was not called upon to make any final recommendation regarding the choice of any particular car, left it for Government to take a final decision after taking into account the reports on their performance after they were tested under Indian conditions, the terms of collaboration, the investment involved and other relevant factors.

The Government accepted the views of the Committee as set out in (a), (b) and (c) above. In the Government Resolution dated 6th September, 1960 the following further observations were made:

"Government of India feel that the aim should really be to select, if possible, a car that will on the one hand be sturdy and give a really long period of trouble free service, and on the other hand be available around Rs. 6,500 to the major body of the consumers inclusive of transport charges, distributors' commission, taxation etc. This would mean that the ex-works price should be around

Rs. 5000. The choice of a car, therefore, assumes crucial importance, as it involves not only the consideration of the mechanical attributes of the vehicle but also a realistic assessment of its production costs in India.....

All these matters require detailed consideration at technical levels. It has accordingly been decided that an Expert Committee should be set up to go into these questions.....

It would be possible to take a final decision about the production of a low cost car only after the Expert Committee has reported. Government have also decided that in case the Expert Committee considers the manufacture of the low cost car feasible within the price range indicated above, the project will be undertaken in the public sector".

Pande Committee.—In accordance with the above decision, the Government of India appointed the Low Cost Car Committee (Pande Committee) to go into the question of examining the feasibility of production of a small car from the technical angle within an ex-factory price around Rs. 5,000 on an annual production of 50,000 cars. The low cost car to be produced should, even at the beginning, have a sufficiently high indigenous content and should be made more or less wholly indigenous within three years from the start of production. The Committee was free to indicate the most suitable site or sites for the proposed plant.

The Pande Committee, in its report, has come to the conclusion that the feasibility of manufacturing a low cost car at the ex-factory price of nearly Rs. 5,000 is no longer in doubt if the production of the vehicle is visualised on the basis of 50,000 units per year. The recommendations of the Committee are under examination. The physical programmes included under the Third Five Year Plan do not cover this project.

Targets.—The targets tentatively proposed for passenger cars, commercial vehicles and jeeps are as follows:

	1965-66
	Nos.
Passenger cars	30,000
Commercial vehicles	60,000
Jeeps and station wagons	10,000

The target for commercial vehicles includes 4,000 units expected to be produced at the ordnance establishments.

It has been pointed out earlier that by the end of the Second Plan period, the indigenous content of the vehicles would have increased by another 10 to 15% on the average since the industry was reviewed by the *Ad hoc* Committee. The indigenous content of the vehicles is steadily rising

and the production of body panels indigenously will be an important development in this field. If the present progress is maintained, it is quite realistic to envisage the achievement of 85 to 90 per cent indigenous content by the end of the Third Five Year Plan period.

Installed capacity and pattern of its expansion.—In order to achieve a capacity of 30,000 cars, 56,000 commercial vehicles, and 10,000 jeeps, the following additional capacity needs to be created:

	(Nos.)
Car	10,000
Jeeps/Station Wagons	4,500
Commercial vehicles	28,000

The above estimates of capacity are based on double shift working of most machinery.

As regards the creation of new capacity, the *Ad hoc* Committee has recommended that it would be undesirable to bring in any new units since a reduction in costs can only be achieved by increasing the scale of operations of existing manufacturers. It is suggested that the additional capacity to be created during the Third Plan period should be secured through the expansions and diversification of the existing units. As regards the relative shares of petrol and diesel vehicles, the consumer preference points to the probability that the additional capacity for commercial vehicles might have to be planned almost entirely for the manufacture of the latter.

Additional capacity to be created.—To provide the additional capacity expansion programmes of some of the existing units have already been approved and some others are under consideration.

Ancillary Industries.—It is estimated by the Development Council for Automobiles, Automobile Ancillary Industries and Transport Vehicle Industries that the demand for the products of ancillary industries will be of the order of Rs. 25 crores by 1965-66. It is envisaged that the capacity and production of the indigenous industry will be of the same order by the end of the Third Plan.

The *Ad hoc* Committee on Automobile Industries observed in the Report that the price of the indigenous components and automobile parts is generally higher than the price of the imported components. The Committee suggested that it is necessary to impose a strict discipline both on the ancillary producers and on the main producers in order to bring down the cost of production of the vehicle and at the same time to help the ancillary industries. An important suggestion made by the Committee is that it would be desirable that some of the major items not generally considered to be the responsibility of the ancillary industry are developed by the automobile manufacturers themselves on a cooperative basis. A special division for the development of ancillary industries not only for the automobile industry but for other industries as well has been set up in the Central Organisation of Small Scale Industries under the Development Commissioner.

There are many possibilities to be explored in the endeavours at standardisation of the various ancillary components particularly the new items planned for production *viz.*, wheels and rims, starter motors, dynamos and lamps.

Investment and foreign exchange.—It is estimated that a total investment of about Rs. 85 crores has to be made in the automobile industry to achieve the targets set for the Third Five Year Plan. The foreign exchange element excluding the requirements in the Defence establishment for the production of commercial vehicles is estimated to be about Rs. 40 crores.

Foreign exchange for the maintenance of production.—The total foreign exchange required on maintenance account over the entire Third Plan period is estimated to be of the order of Rs. 175 crores.

Employment potential during the Third Plan.—With the expansion in the automobile industry and the large number of ancillary units which are expected to come up during the period of the Third Plan, it is estimated that an additional employment of 25,000 will be provided in the industry.

Steel requirements for automobile industry during the Third Plan.—The Development Council for Automobile and Allied Industries has estimated the requirements of steel for automobiles as follows:

tons of steel per 1,000 chassis

Category of Steel	Heavy duty commercial vehicles	Other commercial vehicles	Jeeps	Cars
Sheets and plates	1,620	950	550	750
Carbon steel, bars, billets, tubes and rolled sections	923	550	160	140
Alloy, Steel bars, billets, tubes & rolled sections	700	840	140	130
Steel castings	67	60	..	..
TOTAL .	3,310	2,400	850	970

On the basis of the phased manufacturing programme based on progressive increase in the manufacture of automobiles and allied industries, it is estimated that during the period of the Third Five Year Plan, the number

of cars produced will be about 126,000, jeeps 40,000, and commercial vehicles 220,000. The total steel requirements for these are estimated to be as follows:

Steel required in '000 tons

Types of vehicles	Total Output in Third Plan ('000 Nos.)	Sheets and plates	Carbon steel bars, billets, tubes, rolled section	Alloy steel bars, billets, tubes, rolled section	Steel castings	Total
Heavy duty commercial vehicles	20	32.40	18.46	14·00	1·34	66·20
Other commercial vehicles	200	190.00	110.00	168.00	12.00	480.00
Jeeps	39	21·50	6.30	5·50	...	33·30
Cars	126	88·20	17.60	..	..	105.80
TOTAL	..	332·10	152.36	187.50	13.34	685.30

Other important raw materials required for the automobile industry are non-ferrous metals. Aluminium castings and zinc die castings are available from indigenous sources, while seamless tubes of brass and copper are expected to be available during the period of the Third Plan.

Other raw materials, *viz.* rubber parts, glass, paints, ball and roller bearings and other materials like timber, textile fabrics, upholstery materials etc. will be available from indigenous sources.

The following table summarises the development programme of the automobile industry during the period of the Third Plan:

	1960-61	1965-66
Number of manufacturing units	6	6
Annual rated capacity:		
Cars	20,200	30,000
Commercial vehicles	28,000	60,000
Jeeps and station wagons	5,500	10,000
Production:		
Cars	19,096*	30,000
Commercial vehicles	27,518*	60,000
Jeeps and station wagons	5,501*	10,000
Percentage of indigenous contents for vehicles	65	85 to 90

*Figures relate to Calendar year 1960.

20. MOTOR CYCLES AND SCOOTERS

1. Review of progress in the Second Plan :

Targets.—At the beginning of the Second Plan the installed capacity for motor cycles and scooters stood at 11,000 numbers *per annum* on single shift basis. No further addition to the capacity was envisaged during the period of the Second Plan.

Production was expected to increase from 1,500 in March, 1956 to 11,000 numbers by the end of the Second Plan.

Capacity.—In 1955-56 Messrs. Enfield India Ltd., Madras, were the only unit producing motor cycles with a capacity of 5,000 numbers *per annum* on single shift basis. During the period of the Second Plan, there has been practically no increase in capacity.

As regards scooters, only Messrs. Automobile Products of India were in production with a capacity of 6,000 numbers *per annum* at the beginning of the Second Plan. Since 1959 this unit has been effecting a substantial expansion and its capacity at present stands at 12,000 Nos. *per annum*. In 1960 another unit *viz.*, Messrs. Bajaj Auto Ltd., Poona, started production of scooters with a capacity of 6,000 numbers *per annum* with the result that the overall capacity stood at 18,000 numbers *per annum* on single shift basis.

These two firms were also permitted to manufacture auto-rickshaws within the capacity. The former firm is also manufacturing a 48 c.c. scooterette, within the overall capacity approved for it.

The statewise distribution of the capacity for motor cycles and scootors at the end of 1960-61 was as follows:

State	Unit	Motor Cycles (Nos.)	Scooters & Scooterettes (Nos.)
Bombay	2	..	18,000
Madras	1	5,000	..
TOTAL	3	5,000	18,000

Production.—The production of motor cycles in the country started for the first time in September, 1955. This was followed by the production of scooters commencing in the same year.

The yearly production of motor cycles, scooters and 3-wheelers during the years 1955-1960 was as follows:

	Motor cycles	Scooters	3-Wheelers (Auto-Rickshaws)
	(Nos.)	(Nos.)	(Nos.)
1955	420	528	--
1956	1,022	4,735	529
1957	1,827	6,528	852
1958	2,653	4,391	483
1959	3,239	3,940	947
1960	3,998	12,880	496

The demand for scooters in recent years has developed rapidly.

Import policy and imports.—At the beginning of the Second Plan, imports of motor cycles and scooters were allowed at 50 per cent of the best year's imports. Auto-attachments were allowed to the extent of 30 per cent on the basis of imports of motor cycles and scooters. In the January—June 1957 import policy, the imports were reduced to 20 per cent but thereafter imports were completely banned due to the stringency of foreign exchange.

The actual import* for the last few years have been as under:

	Motor Cycles		Scooters		3-Wheelers		Total	
	No.	Value (Rs.lakhs)	No.	Value (Rs.lakhs)	No.	Value (Rs.lakhs)	No.	Value (Rs.lakhs)
1956	..	..	..	..	..	..	5,659	59·16
1957	3,854	34·01	7,806	114·0	1,612	17·63	13,272	165·64
1958	3,117	28·02	4,370	32·52	2,909	26·48	10,396	87·02
1959	2,987	24·44	4,650	33·29	1,979	30·61	9,616	88·34
1960	3,890	26·97	15,773	112·4	1,730	24·20	21,393	163·57

*The above figures include the C.K.D. packs.

Exports.—As the internal demand of motor cycles and scooters was in excess of the available supplies, the industry had not given thought to the question of exports. Shortage of foreign exchange on maintenance account came in the way of stepping up production to keep pace with the growing demand.

Mopeds or scooterettes.—Moped or scooterette or Auto-cycles are vehicles of a lighter type than motor cycles or scooters, and having an engine capacity of about 50 c.c. Hitherto, M/s. Automobile Products of India Ltd., were the only firm manufacturing this type of vehicles. Production of these vehicles commenced at the end of 1955.

The production of Mopeds during the last five years has been as follows:

	Nos.
1956	1,667
1957	2,430
1958	1,468
1959	1,176
1960	886

The firm engaged in the production of this vehicle gradually concentrated more on the production of scooters than on mopeds.

Trailors.—At the beginning of the Second Plan, there were six units manufacturing trailors with a capacity of 5,232 units *per annum*. One of the units *viz.*, M/s. Mahindra & Mahindra, Bombay, expanded their capacity from 2,040 Nos. to 3,780 Nos. *per annum*. Seven new units came up for production for trailors during the Second Plan period bringing the total capacity to about 8,500 Nos. Besides there are some small firms manufacturing trailors.

The actual production of trailors during the last five years has been as follows:

	Nos.
1956	1,886
1957	1,835
1958	1,920
1959	1,536
1960	2,012

Prices.—The ex-factory prices of motor cycles, scooters and 3-wheelers are as follows:

Motor Cycles—		
Royal Enfield	350 cc	Rs. 3,328·00
	150 cc	Rs. 1,878·00
Scooters—		
Lambretta	150 cc	Rs. 1,580·00
Vespa	150 cc	Rs. 1,815·00
Mopeds—		
Lambretta	48 cc	Rs. 747·00
3-Wheelers—		
Lambretta	175 cc	Rs. 2,647·00 (chassis)
Vespa	150 cc	Rs. 4,415·00 (with body)

These prices are exclusive of excise duties.

Investment & Employment.—It is estimated that an investment of Rs. 2·5 crores has taken place during the period of the Second Plan in this industry. The number of persons employed stands at about 2,500 at the end of 1960.

Problems of the Industry.—Owing to the shortage of foreign exchange, the procurement of necessary imported plant and equipment was slow. The manufacturers had to depend for component supplies on imports because the ancillary industries have yet to develop. The availability of imported components was restricted due to limitation of foreign exchange.

Manufacture of items such as taper roller bearings, ball-bearings, high tensile bolts, nuts and screws, etc., apart from electrical items has yet to develop.

II. Programme of development during Third Plan :

Estimated Demand and Target.—Motor cycles, scooters, and three-wheelers with engine capacities of about 150 c.c. and above form a distinct group in the higher price range of over Rs. 1,500 per unit. Mopeds, scooterettes, and auto-cycles with engine capacity of about 50 c.c. and below may be said to fall in a lower price group. The demand would depend on the price at which vehicles could be produced and marketed. The Development Council for Automobile and Ancillary Industries has estimated a demand of 50,000 numbers of motor cycles, scooters and 3-wheelers by 1965-66. The Planning Commission has accepted this target.

Schemes under implementation.—The following schemes for the production of motor cycles, scooters, scooterettes and mopeds were under implementation at the end of the Second Plan.

Name & Address	Location of Factory	Capacity per annum
M/s. Ideal Jawa (India) Private Ltd., Mysore.	Mysore . .	6,000 Nos.: (i) Motor cycles 250 cc 175 cc. & 50 cc. (ii) Scooters 150 cc.
M/s. Escorts (Agents) Ltd., New Delhi	Faridabad, Punjab .	6,000 Nos : 150 cc motor cycles and scooters.
M/s. Enfield India Ltd. . . .	Madras . .	6,000 Nos : Scooters—193 cc. 173 cc and 147 cc.
Shri P. S. Sound (M/s. Sound & Co.), New Delhi	Faridabad/ Ahmedabad.	Mopeds 3,000 Nos.
M/s. S. B. Dharam Singh & Co. Private Ltd., New Delhi.	Punjab/Bihar .	Mopeds 3,000 Nos.
Shri K. L. Varadarajan, New Delhi.	Hyderabad .	Mopeds 3,000 Nos.
M/s. C. C. Desai & Co., New Delhi.	Gujarat/U.P./Kerala/ Andhra Pradesh.	Mopeds 3,000 Nos.
M/s. Hindustan Steel Products Ltd., New Delhi.	Hyderabad .	Mopeds 3,000 Nos.

With the materialisation of the above schemes, a total capacity of 56,000 nos. per annum on single shift basis will be there. Reckoned on double shift basis this will more than amply meet the target even allowing for any infructuous licensing and thus there is no further scope for expansion of this industry during the Third Plan period.

Raw Materials.—The main raw material required by this industry is steel. The Development Council for Automobile & Allied Industries has estimated the requirement of steel for motor cycles, scooters and 3-wheelers as follows per 1,000 chassis.

Category of Steel	Tons of steel per 1000 chassis	
	Motor Cycles, scooters	3-Wheelers
Sheets & Plates	36	80
Carbon steel bars, billets, tubes and rolled sections	38	49
Alloy & Steel bars, billets, tubes and rolled sections	16	11
Steel castings	..	..
TOTAL	90	140

The other raw materials, *viz.*, aluminium castings, rubber parts, glass, ball and roller bearings, paint, are more easily available from indigenous sources to meet the requirements of this industry.

The following table summarises the development programme of the motor cycles, scooters and 3-wheelers industry during the period of the Third Plan :

	1960-61	1965-66
Number of manufacturing units	2	10
Annual rated capacity :		
Motor cycles, Scooters, 3-Wheelers, and Mopeds	23,000	60,000
Productions :		
Motor cycles, Scooters, Mopeds, and 3-Wheelers	17,550	50,000

21. BALL AND ROLLER BEARINGS

1. Review of Progress in the Second Plan:

Targets.—On the basis of a demand estimate of 2·4 million numbers of ball bearings and assuming multiple shift working of the manufacturing unit in operation *viz.* M/s. National Bearing Company, Jaipur, a capacity target of 0·9 million numbers on single shift by 1960-61 was fixed for the industry under the Second Plan.

Capacity.—At the beginning of the Second Plan there was only one unit, M/s. National Bearing Company, Jaipur which has since changed its name to M/s. National Engineering Industries, engaged in the manufacture of ball bearings and its installed capacity was 600,000 numbers per annum on single shift basis. It continued to be the only large scale unit in the field, for no other unit has gone into production during the Second Plan period.

As a result of the expansion and modernisation programme undertaken by M/s. National Engineering Industries during the period under reference, the annual installed capacity of the industry was raised to 942,000 numbers of ball and roller bearings on single shift.

Production.—Operating on three shifts, the production of M/s. National Engineering Industries is confined mainly to ball bearings below 2" bore diameter. The output of bearings during the past few years was as follows:

	Thousand numbers
1955-56	865
1956-57	1,175
1957-58	1,714
1958-59	2,060
1959-60	1,823
1960-61	3,161

It will be observed that production was increasing steadily up to 1959 when it received a setback on account of labour unrest. However, it again picked up and the production recorded in the last year of the Second Plan showed that it had well exceeded the Plan target of 2·4 million numbers. The range of sizes produced during the year 1959 was 166 in ball bearings and 23 in roller bearings. In the year 1960, it was 159 in ball bearings and 27 in roller bearings.

Imports.—Statistics of the value of import of ball and roller bearings during the Second Plan period are given below:

	Rs. lakhs
1956-57	113·69
1957-58	253·03
1958-59	189·78
1959-60	201·40
1960-61	329·40

The bulk of the bearings imported were above 1" diameter bore. It may be mentioned that almost the entire requirements of taper roller bearings for automobiles and roller bearings for other industries were met by imports.

Demand.—On the basis of the targets of production envisaged under the Second Plan for various industries using ball bearings it was expected that the total demand for ball bearing upto 2" bore diameter would be of the order of 2·4 millions by 1960-61. The Tariff Commission in their 1956 Report on continuance of protection to the ball bearings industry had estimated the demand by 1960-61 at 2·5 million bearings which was reassessed at 4·5 millions in their 1960 Report. The actual consumption of bearings upto 2" bore diameter in 1960-61, however, works out roughly to 4·5 to 5 millions. This figure, it may be pointed out, has been arrived at on the basis of indigenous production and imports of ball bearings. Since the quantity of bearings imported in terms of numbers is not reported in the Monthly Statistics of Foreign Trade, it has been derived indirectly by the conversion of the value of imports. For this purpose, it has been assumed that the average price of bearings upto 1" diameter bore is Rs. 3 per unit and of bearings of higher diameter upto 2" bore, Rs. 5 per unit. The higher level of offtake than that envisaged in the Plan reflects the increased industrial activity in the engineering field, railways, road transport etc.

Quality and standards.—Several measures have been initiated by the producer to improve the quality. Statistical quality control is stated to have been introduced by the firm. It has installed expensive electronic machines for the analysis of bearing noise, checking of roundness and shape of races, sphericity of balls, surface finish, vibrations etc. These and other steps have led to considerable improvement in the quality of bearings, which are at present reported generally to be acceptable to consumers.

M/s. National Engineering Industries has so far been guided by the British standard specifications. In regard to formulation of Indian standards, not much progress has been made beyond formulating a glossary of terms, identification code etc. In view of the importance of the quality aspect of the product, the Tariff Commission in their 1960 Report on continuance of protection to the ball bearings industry recommended that the I.S.I. should expedite the formulation of standard specifications.

Tariff protection.—Protection was first granted to this industry in 1952 when the Government accepted the Tariff Commission's recommendations that the then existing revenue duties on ball bearings not exceeding 2" bore diameter adapted for use as parts and accessories of motor vehicles other than motor cycles and scooters, should be converted into protective duties at the same rates and ball bearings of all kinds not exceeding 2" bore not otherwise specified should be assessable to a protective duty of 94½ per cent *ad valorem*. The rate of duty on adapter bearings not exceeding 2" bore diameter which are specially designed for use exclusively with power driven machinery should be increased to 10 per cent *ad valorem* and

converted into a protective duty. The period of protection was extended upto the end of 1956 when a second enquiry was held and the Tariff Commission recommended that the protective duty on all ball bearings upto 2" bore diameter (other than adapter bearings) should be maintained at the then existing rates. The duty on adapter bearings should be raised to 94½ per cent *ad valorem* so as to bring it on par with other protected types of ball bearings.

As the second term of protection to the industry was to expire on 31st December, 1960, another enquiry on the continuance of protection to the industry was undertaken by the Tariff Commission. The Commission recommended that protection to the ball bearings industry should be continued for a further period of two years ending 31st December, 1962 at the existing rates of duty and that parts of ball bearings and adapter bearings upto 2" bore diameter should also be liable to the same rate of protective duty. This recommendation has been accepted by the Government.

Raw materials.—The principal raw materials for the manufacture of ball and roller bearings are high carbon chromium (H.C.I.) steel bars, tubes and wires which are mainly imported at present. A small quantity of bars is, however, stated to be rolled from steel billets purchased from the Metal and Steel Factory at Ishapur. It is expected that the import of H.C.I. bars can be dispensed with when the proposed Alloy and Tool Steel Plant goes into production. The other important items of raw material *viz.*, mild steel (MS) bars, plates and tubes used for nuts and sleeves of adapter bearings, M.S. wire, brass strips and rods for rivets and cages are available indigenously.

In addition to the above mentioned raw materials, high speed and high carbon tools, grinding wheels, certain chemicals and emery powder are required and most of them are available indigenously.

Capital and labour.—A sum of about Rs. 1 crore is estimated to have been invested in the industry during the Second Plan period. The foreign exchange portion of this investment is placed at about Rs. 80 lakhs.

The number of persons employed in the industry at present is about 2,000.

II. Programme of Development in the Third Plan:

Estimated requirements.—Ball bearings are used for fitment in a number of industries like electric fans, electric motors, power driven pumps, automobiles, railway wagons including coaches and locomotives, tractors and earth moving machinery and textile machinery. In view of the large scale developments envisaged under these industries and other industries which are principal consumers of ball bearings, the demand for these items

would increase considerably. On the basis of the targets of production envisaged for these industries, the requirements of ball and roller bearings by the end of the Third Plan have been estimated as under:

Annual requirements for 1965-66

Consuming industry	Ball bearings. upto 2" dia bore	Ball bearings. above 2" dia bore	Roller bearings
Electric fans	3,500,000	..	..
Electric motors	600,000	..	..
Passenger cars	300,000	120,000	420,000
Commercial vehicles	1,020,000	..	1,518,000
Jeeps and station wagons	30,000	..	220,000
Motor cycles and scooters	400,000	158,000	..
Diesel engines	5,500	49,500	4,600
Power driven pumps	247,500	45,000	34,500
Tractor and earth-moving equipment	44,000	341,000	88,000
Textile machinery	675,000	9,000	279,000
Sugar machinery	75,000	..	..
Heavy machine building plant	821,700	91,300	51,000
Railway wagons including coaches and locos	..	..	150,660
Miscellaneous industries including machine tools, H.E.P.	650,000	250,000	50,000
TOTAL	8,368,700	1,144,800	2,815,760

The total requirements of ball and roller bearings as original equipment, it will be observed, would come to about 12·3 millions by 1965-66. In regard to replacement needs, it may be mentioned that the demand estimate for any year should be based on the assumptions made about the average life of ball bearing and the quantity becoming due for replacement on this reckoning in the period under consideration. It is assumed that the average life of bearing is about 7 years. Adopting the above basis, the replacement requirements of ball and roller bearings by 1965-66 have been roughly estimated at 2·7 millions. Thus the overall demand for ball and roller bearings both as original equipment and replacement would work out to 15 millions per year.

Target of capacity.—The general policy adopted in regard to engineering industries is to reckon capacity on double shift basis. The ball bearing industry has, however, been operating in the past on three shifts. In view of the capital intensive nature of this industry, it is desirable that three shift operation should be maintained in future also.

It is therefore considered that capacity calculated to give an output of the order of 11 million bearings per annum working on two shifts would be sufficient to take care of the requirements estimated at 15 millions if the plants work in three shifts.

Schemes under implementation :

Private sector.—As already mentioned, M/s. National Engineering Industries at present have an installed capacity of 0·942 million bearings per annum on single shift which will shortly be raised to 0.960 millions with the completion of its expansion programme for a single shift capacity of 18,000 axle box bearings, which is currently under implementation. Further, a number of schemes have been licensed and they may be categorised as (a) those covered by foreign exchange and (b) those not covered by foreign exchange (*vide* annexure at the end).

It will be observed that on the basis of the existing capacity and the additional licensed capacity which has already been cleared from the foreign exchange angle, the firm availability of capacity would be of the order of 5·17 million bearings per annum on single shift basis (9·3 millions on double shift basis). Assuming, however, that all the schemes licensed so far would be implemented, the total capacity of the industry would be raised to about 11·13 million bearings per annum on single shift basis (20·0 millions on double shift basis) as against the targetted double shift capacity of 11 millions. There would then be little gap left to be covered by licensing of further capacity. It is important that the progress on schemes under this high priority industry should be carefully watched and assisted.

Public sector.—The Central Government have under consideration the setting up of a plant for the manufacture of ball and roller bearings of different types including those required for motors, machine tools, pumps, coal mining machinery, power machinery, automobiles, railway boxes etc. The project, whose capacity has provisionally been envisaged as 2 million bearings per annum, is estimated to cost Rs. 8 crores, the foreign exchange portion of which is reckoned at Rs. 6 crores.

Investment and employment.—In the absence of detailed project reports setting out in clear terms the production programmes under all the schemes proposed to be implemented and the assumptions made in relation to utilization of capacity, it is very difficult in a complicated industry like ball bearings with its large variety of products to make an accurate forecast of investment and foreign exchange requirements. However, on a rough basis the total investment required during the Third Plan period is estimated at about Rs. 20 crores and the foreign exchange portion thereof at Rs. 13 to 14 crores.

The additional employment likely to be created in the industry during the Third Plan period is estimated at about 8,000.

The following table summarises the development programme of the industry :

(million numbers)

	1960-61	1965-66
Capacity	1·7 (double shift)	11·0 (double shift)
Production	3·2	15·0

ANNEXURE

Name of the firm	New Unit (N.U.) Substantial Expansion (S.E.)	Capacity on single shift (lakh Nos.)
(a) Additional capacity licensed and covered by foreign exchange		
M/s. National Engineering Industries, Jaipur	S.E.	14·58
M/s. Investment Corporation of India, Bombay (Indian S. K. F. Manufacturing Co.).	N.U.	12·00
M/s. Antifriction Bearing Corpn., Lonavala, Maharashtra	Do.	3·025
M/s. Bharat Ball Bearing Co., Ranchi	Do.	12·50
TOTAL OF (a)		42·105
(b) Additional Capacity licensed but not covered by foreign exchange		
M/s. Pioneer Bearing Co., Coimbatore	N.U.	6·60
M/s. Hindustan Ball Bearing Co., Agra	Do.	15·00
M/s. New Commercial Bearing Corpn., Ahmedabad	Do.	15·00
M/s. Indian Bearings Ltd., Ahmedabad	Do.	9·00
M/s. Kamala Shankar P. Joshi, Bombay	Do.	8·0
M/s. New Haven Steel Balls Corpn., Bombay	Do.	6·00
TOTAL OF (b)		59·60
GRAND TOTAL (a+b)	101·705 lakhs or say 10·2 millions.	

22. COMPRESSORS

For a rational planning of indigenous development, compressors have been broadly classified into the following categories:

(a) compressors of below 100 cu. ft. per minute of free air delivery capacity with pressure upto 8 to 9 atmospheres—stationary and portable;

(b) medium compressors of over 100 cu. ft. per minute free delivery capacity upto 8 to 9 atmospheres—both for stationary and portable use.

(c) heavy duty and high pressure compressors for continuous duty in large industrial undertakings such as shipyards, automobile factories & structural shops; for preparation and bottling of industrial gases such as carbon-dioxide, oxygen, nitrogen and chlorine; for ammonia synthesis in fertiliser plants; in steel works and for compressing gases in oil refinery and other petro-chemical industries.

1. Review of progress in the Second Five Year Plan:

No development programme was formulated and targets fixed for the compressors industry under the Second Plan. The growth of this industry in the country is of recent origin considering the fact that prior to 1958 there was practically no unit engaged in regular production of this item. Imports were freely allowed to meet the domestic requirements. With the reduction in quotas enforced on established importers, serious attention began to be given by several parties to the need for developing the indigenous production of compressors. Of the 12 firms licensed upto the end of 1960—all but one have tied with foreign collaboration for know how—five have gone into production by the end of the Second Plan and the schemes of the rest were under implementation. The details relating to the existing position are given below:

Capacity for Air and Gas compressors

Firm	Location	Annual capacity licensed	Collaborator
1	2	3	4
A. Already in operation :			
M/s. Consolidated Pneumatic Tool Co. Ltd., 41/42, Marine Lane, Bombay.	Bombay .	96	CPTGO Ltd., U.K.
M/s. Kirloskar Pneumatic Tool Ltd., Hadapsar, Poona.	Poona . .	912	Broom & Wade Ltd., U.K.
M/s. T. Maneklal Mfg. Co., Dinshaw Wacha Road, Churchgate, Bombay.	Bombay .	100	SLM, Switzerland.

1	2	3	4
M/s. Holman Climax Mfg. Ltd., Chartered Bank Bldgs., Calcutta.	Calcutta . .	60	Holman Bros., U.K.
M/s. K. G. Khosla & Co. (P) Ltd., 1, Deshbandhu Gupta Road, New Delhi.	Delhi . .	2,700	MAW Varmala Stranger Co., Vienna.
B. Under implementation :			
M/s. New Standard Engg. Co. Ltd., Carrol Road, Bombay-13.	Bombay . .	96	Deprag Pressuluft Muschinen Schuly KG Ambar/OPF, Germany.
M/s. Shri Ram Mills Ltd., Ferguson Road, Parel, Bombay.	Bombay . .	240	(1) Hydrovane Compressores, U.K. (2) Tilghman Ltd., U.K.
M/s. Elgi Equipments (P) Ltd., India House, Coimbatore.	Coimbatore .	650	Pumpenfalrik Urach W.G.
M/s. Atlas Copco Private Ltd., Nicol Road, Ballard Estate, Bombay.	Bombay . .	72/132	Atlas Copco, Sweeden.
M/s. Surrendra Industries (P) Ltd., 209, Argyle Road, Bombay.	Bombay . .	1,380	Nil.
M/s. Hindustan Gas Co., 22, New Tonga Road, Calcutta.	Calcutta . .	204 initial, 300 ultimate	Limox, Berlin Ltd., U.K.
M/s. Triveni Heavy Engg. Corporation Ltd., New Delhi.	Allahabad .	Worth about Rs. 10 lakhs.	Brookers Engg. Holding Ltd., U.K.

The firms listed above have planned for the manufacture of compressors referred to under (a) and (b) in the first para. The actual capacity approved in favour of the five units in production at the end of 1960 was assessed by the Development Wing at about 2,600 numbers. On the full implementation of the programmes of the 12 firms, an annual capacity of 6,666 numbers would be achieved.

Production.—According to the approved programmes the production of six of the licensed firms would also cover the manufacture of small compressors of capacity upto 100 cu. ft. of air per minute. The remaining firms have programmes for the manufacture of compressors of above 100 cu. ft. of air per minute and going generally upto 500 cu. ft. of air per minute.

Actual production between 1958 and 1960 was as follows :

	Size below 100 cu. ft. (Nos.)	Size above 100 cu. ft. (Nos.)	Total (Nos.)
1958	34	Nil	34
1959	306	231	537
1960	1,037	678	1,715

The progress recorded in the last three years is considered equally satisfactory in terms of indigenous content achieved. In the case of the smaller ranges, the indigenous content was 95 per cent by the end of the Second Plan whereas in the higher ranges it was about 75 per cent. The principal items at present imported are crank shafts, valves, main bearings, internal and external coolers. The value of the output of compressors in 1960 has been estimated at Rs. 1·5 crores. The price of an indigenous 110 cu. ft. compressor is about Rs. 12,000. It is about Rs. 16,000 and Rs. 38,000 respectively in the case of compressors of a capacity of 250 cu. ft. and 500 cu. ft. of air per minute.

In respect of quality and technical performance, the indigenous manufactures are at present normally guided by the specifications followed by their respective collaborators of the different foreign countries.

Import and Export.—Till 1958 the import policy for compressors was liberal. Thereafter a gradual reduction in the quota of the established importers was affected. The annual value of import of air-compressors as given in the Monthly Statistics of foreign trade of India, is given below:

	Rs. Crores
1957	2·18
1958	0·83
1959	1·23
1960	1·61

Compressors imported as part of complete plants and as part of big installations do not appear to have been included in the above figures. On the other hand, engines imported along with compressors might sometimes have been included in the above import data. These data may not, therefore, reflect the correct value of imports of this item.

The import of compressors has been considerably reduced and the gap is being filled by indigenous production. The indigenous product has been allowed a price preference of 25% as compared to the landed price of imported product.

The indigenous industry is still in the initial phase of development and attempts were being made by the individual concerns to export to Ceylon, Afghanistan, Burma and Malaya at the end of the Second Plan.

Employment.—The employment in this industry during early 1961 was estimated to be 1,500.

Problems of the industry.—During the Second Plan period the Compressors manufacturers, who have also not taken up the manufacture of prime movers, experienced considerable difficulty in obtaining diesel engines to match their products from indigenous sources. The Indian engine manufacturers could not increase and diversify their production so as to satisfy the demand of the compressors manufacturers. Till such time as the indigenous production of matching engines has been established, the compressors manufacturers would have to import diesel engines from East European countries, particularly Yugoslavia where equivalent makes of engines were being produced.

II. Programme of development in the Third Five Year Plan:

Estimates of requirements.—The annual requirements of compressors during the Third Plan period, as estimated by the Development Wing, is 6,000 numbers of sizes below 100 cft. and 2,000 numbers of those above 100 cft. bringing the total to 8,000 numbers. In terms of value, these requirements would be worth about Rs. 5·0 crores.

Apart from above, the requirements of high pressure and heavy duty compressors for use in fertilizer plants, steel mills, oil refineries and such other larger undertakings have been tentatively assessed on the following basis:

(a) In steel plants, on the assumption that most of the steel expansion, reckoned at 1·0 million tons of ingot capacity per year would be on the L.D. process requiring about 300 tons oxygen per day, the demand for compressors would come to 4,500 H.P. per year.

(b) For building 200,000 tons per year of nitrogenous fertiliser manufacturing capacity, the estimated annual requirement of compressors capacity is 40,000 H.P. This is on the basis of 21,000 H.P. compressor capacity required for manufacture of 100,000 tons of fertilizers per year.

(c) Estimated compressor requirement for industrial gases compression comes to 5,000 H.P. annually.

(d) On the assumption that two more refineries of the size of the STANVAC refinery will be installed during the Third Plan period, compressor requirement for oil refineries works out to about 600 H.P. per year.

Adding another 10% for other industrial uses and replacement purposes, the total of the estimated requirements would be of the order of 55,000 H.P., which, in terms of value comes to about Rs. 2·5 crores.

Targets.—A capacity and production target of Rs. 7·5 crores worth of compressors, of which Rs. 2·5 crores would be of the high pressure and heavy duty types, would, on the basis of the above demand assessment has to be envisaged for 1965-66.

New Schemes under implementation.—A number of schemes designed to increase the capacity of the industry has already been licensed in the private sector under the Industries (Development and Regulations) Act. The details of the schemes approved, which are in varying stages of implementation have been given in the table under para 2 above.

Public Sector project.—The Third Five Year Plan has made a tentative provision for a Compressors and Pumps Project in the Public Sector, roughly estimated to cost Rs. 15 crores, of which Rs. 10 crores may be the foreign exchange element. The scope of this project is yet to be firmly decided. It is expected that heavy duty air and gas compressors will be taken up for manufacture. The production programme will be finalised after taking into account the Third and Fourth Plan period requirements of heavy duty compressors, regarding which a preliminary assessment has been made as indicated under 'Estimate of Requirements'.

Additional capacity required.—With implementation of the schemes described above, the annual rated capacity of the industry on double shift basis would be about Rs. 8·6 crores and the targets set for the Third Plan can be expected to be achieved.

Investment.—Additional investment during the Third Plan period for the private sector enterprises has been estimated to be Rs. 65 lakhs of which the investment due to plant and equipment will be Rs. 50 lakhs. Plant and machinery required for replacement purpose during the Third Plan period have been estimated to be Rs. 8 lakhs.

Development Council.—Compressors come within the purview of the Development Council of internal combustion engines, power driven pumps, compressors, industrial fans and blowers.

Miscellaneous.—Proper co-ordination of activity on the part of ancillaries, compressors and engine manufacturers, is of vital necessity. Through the medium of the Development Council or their associations, the industries should make an effort to effect proper coordination in this respect.

The following table summarises the Development Programme of the Compressors industry envisaged during the period of the Third Plan:

	1960-61	1965-66
Capacity (Rs. crores)	2·3	7·5
Production (Rs. crores)	1·5	7·5

23. AGRICULTURAL IMPLEMENTS AND MACHINERY

The programme for agricultural implements and machinery is discussed under the following heads :—

(a) Improved agricultural implements,

(b) Power driven agricultural machinery, comprising :—

(i) Power driven pumps (Centrifugal).

(ii) Diesel engines.

(iii) Agricultural tractors.

A. Improved Agricultural Implements

1. Review of Progress in the Second Plan :

Targets.—No specific targets were indicated for agricultural implements in the Second Plan as statistical data regarding imports and production were not available and hence no accurate idea of future demand could be formed. It was, however, expected that the demand for improved implements would expand, the extent of such expansion depending upon factors such as the trend of agricultural price levels, the progress made by the extension services in popularising improved implements and the evolution of improved designs.

Capacity.—At the end of the Second Five Year Plan there were 60 factories engaged in the manufacture of improved agricultural implements and registered with the Development Wing of the Ministry of Commerce and Industry as against 62 reported for 1955-56 in the "Programmes of Industrial Development, 1956-61". The annual capacity of these factories has been assessed at 30,900 tons in terms of steel.

M/s. Tata Iron and Steel Co., Jamshedpur, is the largest unit having an annual capacity of 14,400 tons. The statewise distribution of these factories is shown below :

State	No. of Factories	Annual rated capacity in terms of steel (tons)
1	2	3
Bihar	3	14,690
Punjab	6	552
Gujerat	1	40
Maharashtra	12	4,796
Uttar Pradesh	10	1,356
West Bengal	11	4,504
Delhi	3	1,888

1	2	3
Andhra Pradesh	4	600
Madras	4	1,148
Madhya Pradesh	1	70
Mysore	2	656
Himachal Pradesh	1	300
Kerala	2	300
TOTAL	60	30,900

Public Sector Projects.—The above 60 units include two units in the public sector *viz.*, the Nahan Foundry and the Mysore Implements Factory. The Nahan Foundry produces besides implements sugar cane crushers, metric weights etc. The types of improved agricultural implements which are being produced by the industry can be broadly classified into 7 categories as under :—

(1) Field implements, such as ploughs, cultivators, seeding, planting and threshing machines.

(2) Agricultural hand tools, such as spades, shovels, hoes, pruning and cutting knives.

(3) Irrigation equipment, such as persian wheels and manually operated water pumps.

(4) Machinery for processing agricultural products such as oil ghanis, cane crushers, chaff cutters and tobacco barns.

(5) Dairy and poultry farm equipment, such as churns, cream separators and honey extractors.

(6) Plant protection equipment such as sprayers and dusters.

(7) Farm transport equipment, such as wheel barrows, farm casts and hand push carts.

Production.—The production of agricultural implements by the organised sector of the industry, in terms of steel has been as follows during the last six years:

	Production (tons)
1955	13,875
1956	16,815
1957	15,224
1958	14,000
1959	16,108
1960	17,400

From the above figures of production it will be seen that except during 1958 the production has shown a steady increase during the Second Plan period, even so a large portion of capacity in existence is still lying unutilised.

Imports.—Imports of agricultural implements since 1956 have been as follows:

	Imports (Value Rs. lakhs)
1956	92·22
1957	65·40
1958	79·09
1959	70·52
1960	38·99

Exports.—The figures for exports upto 1956 are not available as agricultural implements were not separately classified in the Foreign Trade and Navigation Accounts of India upto December, 1956. The exports since 1957 in terms of value have been as follows:

	(Value Rs. lakhs)
1957	1·21
1958	2·16
1959	0·90
1960	0·73

The exports have been mainly to South East Asian, Middle East and East African countries and it is felt that there is some scope for developing export markets in these countries.

Estimated consumption and requirements.—In the absence of any definite statistical data regarding imports and production of agricultural implements on comparable lines, it is difficult to assess the actual offtake of agricultural implements.

Small-scale sector of the industry.—According to a survey conducted by the Central Small Industries Organisation of the Ministry of Commerce and Industry, there were approximately 800 small-scale units in 1955 in

the country which manufactured agricultural implements. The value of output of these units was estimated at Rs. 3·86 crores and it was further expected to increase to Rs. 7·71 crores by the end of the Second Plan. In addition, there were about 1,440 fabricating and 71,160 cottage units in the Northern and Eastern Regions employing 9,760 and 250,183 persons respectively. The list of the items to be manufactured in the small scale and the large scale sectors is given in the annexure.

Measures taken for the development of the industry.—A number of measures were taken during the Second Plan period for the healthy development of the industry. A number of blacksmithy units, in the form of mobile blacksmithy demonstration units, training-*cum*-production centres and blacksmithy workshops were set up in all the States to impart training to blacksmiths in the use of improved techniques of production. Research on evolving improved agricultural tools, implements and machines has been in progress. Two Regional Research-*cum*-Testing Stations at Delhi and Coimbatore were set up during 1956-61 and it is proposed to set up two more such centres during the Third Plan. The Small Industries Service Institutes and 25 Extension Centres provide technical guidance and help in the manufacture of agricultural implements. The Ministry of Community Development and Cooperation have accepted a scheme for setting up 1,000 servicing-*cum*-common facility workshops in rural areas preferably in Community Development Blocks for servicing, repair and maintenance of agricultural implements.

In 1960, the Government of India appointed a Committee to assess the plan needs of agricultural equipments. The Committee will assess the demand for the various types of equipment required to implement the agricultural development programmes under the Third Plan. The Committee will also review the progress in the development of indigenous agricultural equipments as it was at the end of the Second Plan. It will also assess the total investment and the foreign exchange requirements for the development of agricultural equipment for the Third Plan.

II. Programme of Development in the Third Plan:

It is difficult to form an accurate estimate of the future requirement of improved agricultural implements in the absence of data relating to volume of production and imports of different types of agricultural implements. It is, however, expected that as more area is brought under irrigation and cultivation and improved agricultural practices are developed, the demand for agricultural implements will go up during the period of the Third Plan. The need for improved agricultural implements will also arise in view of new methods of cultivation to be introduced through the Community Projects and the National Extension Service.

Till the recommendations of the Committee appointed by the Government of India to assess the Third Plan needs of agricultural equipment are available, it is not possible to fix any targets for the Third Plan. The position would be examined when the Committee submits its report.

As regards the steel requirements of the industry during the Third Plan, the Working Group on Agriculture has estimated that the quantities of iron and steel required for agricultural purposes exclusive of oil engines, tractors, electric motor etc., will be about 3 million tons for the entire Third Plan period and the requirement for 1965-66 being 0·8 million tons.

B. Power Driven Agricultural Machinery

(i) *Power Driven Pumps (Centrifugal)*

I. Review of progress in the Second Plan:

Targets.—At the time of the formulation of the Second Five Year Plan, it was estimated by the Planning Commission that the annual demand of power driven pumps would be about 86,000 pumps per annum by 1960-61.

Capacity.—At the beginning of the Second Five Year Plan there were 27 units on the active list of the Development Wing engaged in the manufacture of power driven pumps and the installed capacity of these units was 67,492 pumps per annum. At the end of the Second Plan there were 48 units engaged in the manufacture and their licensed capacity was 127,846 pumps per annum.

The statewise distribution of capacity was as follows:

State	No. of units	Capacity (Numbers)
Maharashtra	8	23,860
Madras	22	66,392
West Bengal	7	16,220
Madhya Pradesh	1	100
Gujerat	5	16,880
Uttar Pradesh	2	3,400
Bihar	1	194
Delhi	1	300
Kerala	1	500
Total	48	127,846

It will be seen that from the regional considerations the industry is fairly widespread though there is a degree of concentration of capacity in the state of Madras. Of the 48 units, the biggest are M/s. Dandayusthapani, M/s. Kirloskar, M/s. Best and Co., and M/s. British Electrical Pumps.

The capacity of 48 units shown above includes the capacity for deep well turbine pumps also which are required for developing the underground water resources in certain areas of the country. At the end of the Second

Plan there were 5 units manufacturing deep well turbine pumps with a capacity of 2,000 pumps per annum. The names of the units along with their capacities are given below:

Name of the firm	Annual rated capacity (Numbers)
M/s. Jyoti Ltd., Baroda	800
M/s. Hindustan Industrial Corporation, Ghaziabad	100
M/s. Delta Engineering Co., Meerut	180
M/s. Ruston & Hornsby, Bombay	200
M/s. Macneill Berry, Calcutta	720
TOTAL	2,000

Production.—The actual production of power driven pumps during the last six years has been as follows:

	Production ('000 Nos.
1955-56	37
1956-57	51
1957-58	68
1958-59	82
1959-60	85
1960-61	105

The power driven pumps industry has made considerable progress during the Second Plan period. The production has shown a progressive increase over the 1955-56 level and the achievements have exceeded the Second Plan targets.

Types of pumps manufactured.—A number of firms have increased the range of their production by undertaking the manufacture of bigger sizes; the largest size that is now being manufactured is one having 24" delivery diameter. Some of the firms have also undertaken the manufacture of specialised pumps such as submersible type of pumps, petrol dispensing pumps, pumps requiring fractional horse power motors for their operation and pumps required for sugar, paper and cement industries, multistage and axial flow pumps. It may be said that except for a few specialised types and sizes of pumps that may be required for corrosive liquids, the pumps manufactured in the country would practically cover all the divergent requirements.

Imports.—The imports of centrifugal pumps including turbine pumps since 1956 in terms of number and value have been as under :

	Nos.	Value (Rs. lakhs)
1956	..	80·82
1957	6,173	123·84
1958	3,044	94·13
1959	3,200	102·40
1960	2,732	126·38

Exports.—The figures of exports upto 1956 are not available as the exports of the centrifugal pumps were not recorded separately in the Foreign Trade and Navigation Accounts of India. Exports since 1957 are given below :

	Nos.	Value (Rs. lakhs)
1957	289	1·09
1958	695	2·17
1959	1,173	2·87
1960	1,036	5·06

Consumption.—It was not possible to estimate precisely the number of pumps available to meet the internal requirements upto 1956 as the imports were recorded in terms of value only. Since 1957, imports and exports are given in terms of numbers as well as value. The number of pumps available for internal consumption obtained by adding production and imports minus exports for the last six years were as under :

	Production (Nos.)	Imports (Nos.)	Exports (Nos.)	Consumption (Nos.)
1955-56	37,000	4,234	..	41,234
1956-57	51,000	4,400	..	55,400
1957-58	68,000	6,173	289	73,891
1958-59	82,000	3,044	695	85,349
1959-60	85,000	3,200	1,173	87,027
1960-61	105,000	2,732	1,036	106,696

Quality.—The quality of indigenous pumps is generally satisfactory and the manufacturers have taken adequate steps for keeping up the standards.

Raw materials.—The principal raw materials required for the manufacture of pumps can be classified broadly into two categories namely (i) ferrous materials including pig iron for base plate and pump body and mild steel for shafts and keys and (ii) non-ferrous materials, mainly gun metal for impellers and bushings. All these raw materials are available from indigenous sources. Certain components like ball bearings, bolts with nuts, strainers, packing gland etc., are also required. It is hoped that the country will become self-sufficient in all respects when raw materials like ball bearings and certain backings and seals which are partly imported at present become available from indigenous sources.

Capital and labour.—Most of the units manufacturing power driven pumps are also producing other machinery side by side. So it is not possible to give correct estimates of investment in this industry separately.

The total number of persons employed by the units manufacturing centrifugal pumps is estimated to be of the order of 9,000 to 10,000 at the end of the Second Plan.

Development Council.—A Development council for power-driven pumps and diesel engines was set up in March, 1953 under the Industries (Development and Regulation) Act which was later expanded to include compressors also. The Council has been reviewing the progress of the industry from time to time and advising Government on different aspects of development.

II. Programme of Development in the Third Plan:

Estimated requirements.—The demand for power driven pumps is essentially linked with the progress of irrigation programmes and the development of various industries like Chemicals, paper and sugar, which require pumps. In view of the large-scale development of these industries and progress of irrigation schemes envisaged during the Third Plan, it is expected that the demand for power driven pumps will grow in numbers as well as range and types. Although it is difficult to give exact estimate of the probable rise, it is felt reasonable to put the demand at about 150,000 pumps per annum by 1965-66.

Targets of capacity and production.—To achieve a production level of 150,000 pumps per annum by 1965-66, a capacity of 184,000 pumps will be required on double shift by the same period.

Schemes licensed and under implementation.—Licenses have been granted for establishing 14 new units with a capacity of 9,240 pumps and for substantial expansion of one unit with a capacity of 10,995 pumps giving altogether an additional capacity of 20,235 pumps.

Details of the schemes are given below:

Name of the Unit	Nature of scheme	Capacity Licensed (Nos.)
M/s. Brady Engineering, Bombay	New Unit	60
M/s. Shri Ram Mills, Bombay	Do.	1,200
M/s. Hindustan Commercial, Varanasi	Do.	500
M/s. Industrial and Agricultural Co., Madras	Do.	1,000
M/s. Ranga Swami Naidu, Coimbatore	Do.	3,000
M/s. Krishna Foundry, Coimbatore	Do.	500
M/s. Crescent Agencies, Bombay	Do.	720
M/s. K. S. B. Pumps (P) Ltd., Bombay	Do.	820
M/s. Associated Cement, Bombay	Do.	Not yet decided
M/s. Kirloskar Bros. Ltd., Satara	Substantial Expn.	10,995
M/s. Orient Engg. Works, Bombay	New Unit	50
M/s. A. P. V. Engg. Co. (P) Ltd.	Do.	40
M/s. V. Pamlays (P) Ltd., Bombay	Do.	200
M/s. Vulcan Trading Co. (P) Ltd., Calcutta	Do.	400
M/s. Ganpathy Engg. Manufacturers (P) Ltd., Coimbatore	Do.	750

Heavy compressors and Pumps Project.—A project for the manufacture of heavy compressors and pumps has been included in the Third Plan. The scope and other aspects of the project are under consideration at present.

Additional capacity required.—With the implementation of all the schemes mentioned above there will be 62 units and the rated capacity of the industry will increase to 147,901 pumps per annum. The demand estimated by 1965-66 is 150,000 numbers and even if it were to increase and touch a figure of 200,000 nos., it would be possible to meet the whole requirement by working this capacity on multiple shift basis. There is no need to license any more capacity during the Third Plan period particularly if the compressors and pumps project in the public sector is implemented.

Raw material.—Assuming that one pump requires 2 cwts. of pig iron, 15 lbs. of steel for a horizontal pumps (0·7 tons for vertical spindle pump) and 6 lbs. of gun metal, the total requirements for the production targets of 150,000 pumps will be as follows:

Pig iron	15,000 tons
Steel	3,500 tons
Gun Metal	375 tons
Ball bearings	327,000 Nos.
Coke	6,000 tons

(ii) *Diesel Engines*

1. Review of Progress under the Second Plan:

Targets.—A production target of 20,000 to 21,000 numbers of diesel engines ranging from 1 to 50 HP was fixed for the Second Five Year Plan.

Capacity.—At the beginning of the Second Five-Year Plan, there were 16 units engaged in the manufacture of diesel engines and their installed capacity was 19,769 numbers per annum. At the end of the Second Plan, there were 23 units in production and their licensed capacity was 47,680 numbers per annum. In addition, there are some firms which manufacture Road Vehicular type of diesel engines. The bigger units out of the 23 diesel engines establishments are M/s. Cooper Engineering Co., M/s. Kirloskar Oil Engines and M/s. Kulko Engineering.

The statewise distribution of capacity at the end of the Second Plan was as under:

State	No. of Units	Annual licensed capacity (Nos.)
Maharashtra	9	33,910
Madras	4	2,110
Uttar Pradesh	4	896
West Bengal	1	3,000
Punjab	2	5,004
Gujerat	3	2,700
TOTAL	23	47,680

It will be seen that the industry is heavily concentrated in the State of Maharashtra.

Production.—The production of stationary type of diesel engines during the last six years has been as under:

	Production (Nos.)
1955-56	10,371
1956-57	12,436
1957-58	19,263
1958-59	27,411
1959-60	31,338
1960-61	43,215

The diesel engine industry has made considerable progress during the Second Plan period. The production has shown a progressive increase over the 1955-56 level. The production in 1960-61 was more than double the target fixed for that year.

Types and sizes of engines manufactured.—New types and ranges of diesel engines were manufactured during the Second Plan period. The type and sizes produced may broadly be classified as under :—

(i) Single cylinder horizontal engines (3½ to 50 HP).

(ii) Single cylinder vertical engines (3 to 12 HP).

(iii) Multicylinder vertical engines (16 to 200 HP).

Small Scale Sector :

According to a survey conducted by the Central Small Scale Industries Organisation during 1956, there were 50 small scale units (31 in the northern region and 19 in the Western region) manufacturing diesel engines. Of these, the capacity of 42 units was estimated at 3,647 and production at 1,778 numbers. In addition, there were 42 units manufacturing spare parts.

Imports.—The import of stationary type of diesel engines since 1956 are given below:

	Imports	
	Quantity (Nos.)	Value (Rs. lakhs)
1956	1,730	123·5
1957	1,793	144·0
1958	469	48·0
1959	233	33·0
1960	597	46·2

Exports.—Exports of diesel engines upto 1956 were not recorded separately in the Foreign trade and Navigation Accounts of India. Exports since 1957 are given below:

	Exports	
	Quantity (Nos.)	Value (Rs. lakhs)
1957	604	8·44
1958	745	9·71
1959	987	13·28
1960	141	3·15

It will be seen that the industry took some steps to export the diesel engines. It appears that there is a potential demand for Indian manufactured diesel engines in the Middle East and Far East countries.

Consumption.—The total number of diesel engines available to meet internal requirements (production plus imports minus exports) has been as under:

	Production (Nos.)	Imports (Nos.)	Exports (Nos.)	Consumption (Nos.)
1955-56	10,371	2,577	..	12,948
1956-57	12,436	1,730	..	14,166
1957-58	19,263	1,793	604	20,347
1958-59	27,411	469	745	27,135
1959-60	31,338	233	987	30,584
1960-61	43,215	597	141	43,671

It will be seen that there has been a big increase in the consumption of diesel engines during the Second Plan period.

Diversification of production and manufacture of components.—A significant development of the industry during the Second Plan was that the industrial offtake for the engines (for use on road rollers, air compressors, stone crushers etc.) gained momentum considering that engines production prior to 1956 was entirely linked to agricultural uses only. The first prototype of 200 HP engine has already been developed in one of the indigenous establishments and regular production of the type is likely to commence very soon. It is hoped that this would be extended to engines upto 650 HP by the middle of 1962.

There has been appreciable progress in the manufacture of components also and except crank shaft and connecting rods, most of the parts are available indigenously.

Quality of engines.—The quality of diesel engines has been generally good and acceptable to the consumers.

II. Development Programme in the Third Plan:

It is difficult to estimate with much accuracy the future demand for diesel engines. As a prime mover for agricultural pumps, diesel engines may be expected to encounter increasing competition from the electric motor. The demand for diesel engines will get confined mainly to those areas where electric power will not be available. On the other hand the demand for diesel engines for industrial purposes will gain further momentum. On the whole it may reasonably be estimated that the demand for diesel engines by 1965-66 will be of the order of 66,000 numbers per annum.

Targets of capacity and production.—To achieve a production level of 66,000 numbers of diesel engines per annum by 1965-66, capacity of about 72,000 numbers will be required on double shift by the same period.

Schemes licensed and under implementation.—Licences have been granted for establishing eight new units with a capacity of 15,095 diesel engines. Details of the schemes are given below:

Name of the Unit	Capacity Licensed (Nos.)
M/s. Good Earth Manufacturing Corporation, Faridabad	3,000
M/s. Tractors and Bulldozer (P) Ltd., Baroda	1,000
M/s. Mahindra and Mahindra, Bombay	3,600
M/s. T. Maneklal Manufacturing Co., Bombay	75
M/s. Yanmer India Ltd., Madras	1,000
M/s. Nagardas Bechardas & Broths., Ahmedabad	Not assesssed
M/s. Duetz India Ltd., Bombay	3,900
M/s. Kirloskar Commins (P) Ltd., Poona	2,520

Marine Diesel Engine Project.—A project for the manufacture of diesel engines required for ship-building, and the miscellaneous demands arising from programmes for the manufacture of shovels, earth moving equipment etc., has been included in the Third Plan. The cost of this proposed public sector project is placed at Rs. 3·0 crores with a foreign exchange component of Rs. 1·5 crores. Details of the project are given under the Programme of Development for ship-building industry.

Additional capacity required.—With the implementation of all the schemes mentioned above, there will be 31 units and the rated capacity of the industry will increase to 62,775 engines per annum. The estimated demand by 1965-66 is 66,000 numbers and even if it were to increase and touch a figure of 100,000 numbers as has been recently expressed by the Development Council, it will be possible to meet the whole requirements by working this capacity on multiple shift basis.

Raw Materials.—Majority of the raw materials are available indigenously. Some parts like crank shaft and connecting rods, are imported. Steps should be taken during the Third Plan to develop sufficient capacity for forgings in the country so that the imports could be further eliminated.

The quantities of principal raw materials required for the production of 66,000 diesel engines are estimated to be approximately as follows:

	tons
Pig iron	42,000
Steel	45,000
Bronze	1,600

(iii) *Agricultural Tractors*

1. Review of progress in the Second Plan:

Targets.—It was estimated by the Committee on Tractors and Tractor drawn Agricultural Implements appointed by the Ministry of Commerce and Industry in September, 1955, that the total requirements for all types of tractors would be 5,000 numbers per annum by 1960-61.

The Committee classified tractors into 3 broad groups for purposes of demand and estimated the requirements for various ranges as follows:—

12-18 DBHP	1,500 Nos. per annum.
20-30 DBHP	3,000 Nos. per annum.
35-45 DBHP	500 Nos. per annum.

The Committee also mentioned that since the demand of 35-45 DBHP tractors was very meagre, it may not be economical to develop within the country the manufacture of tractors of this range.

As against the above estimates, the Second Plan envisaged a production and capacity target of 3,000 and 4,800 number respectively for a range of 20 to 30 DBHP by 1960-61.

Capacity and Production.—At the beginning of the Second Five Year Plan, there was no regular tractor manufacturing plant in the country and the requirements were met by imports. A few firms were however assembling tractors in association with foreign collaborators from C.K.D. packs.

A licence was granted in favour of M/s. Standard Motor Products of India Ltd., Madras for the manufacture of 4,800 numbers of Ferguson tractors a year in 1955 which was later on revoked. One new unit *viz.* M/s. Good Earth and Co. has recently gone into production (since Sep. 1960) at the rate of about 50 tractors a month.

Besides the above, one independent unit *viz.* M/s. Marshall and Sons Co. (India) Ltd., Calcutta is engaged in the manufacture of tractor-drawn agricultural implements with a capacity of 200 and 400 nos. of ploughs and cultivators respectively.

Imports.—The import of tractors through normal trade channels was liberal upto December 1956. From January to June 1957, the provision was reduced to 50% and there was no provision at all for the periods July-September 1957 and October 1957-March 1958. For the licensing period April-September 1958 and October 1958-March 1959, there was a provision to the extent of about Rs. 30 lakhs for the import of about 250 tractors per half year.

To make up the shortfall to some extent in the import of tractors through normal trade channels and also because good and cheaper tractors could be had on special rupee payment basis, from the countries with which India's export trade was developing, tractors including conventional ones have been imported through the State Trading Corporation from the licensing period January-June 1957. Important East European countries from which tractors have been imported are Russia and Czechoslovakia.

The import of tractors for the last 5 years has been as follows:

	Quantity (Nos.)	Value (Rs. lakhs)
1956	4,468	621·05
1957	4,792	456·09
1958	3,733	237·60
1959	2,652	143·44
1960	3,843	333·11

Consumption.—It was estimated by the Committee on Tractors and Tractor Drawn Agricultural Implements that the requirements of tractors would reach a figure of 5,000 numbers per year by 1960-61. The import figures during the period of the Second Plan show that the average number of tractors added annually was about 3,900. This shortfall appears to be due to the restrictive import policy followed during the Second Plan period due to foreign exchange difficulty. It is estimated that about 35,000 tractors were in use at the end of Second Plan in the country as against about 20,000 at the beginning of the Second Plan.

Investment.—A sum of about Rs. 20·0 lakhs is estimated to have been invested in this industry during the Second Plan period. Out of this machinery worth Rs. 1·5 lakhs has been imported.

II. Programme of Development during the Third Plan Period:

Estimated Requirements.—The working Group appointed by the Ministry of Food and Agriculture has estimated that the demand of agricultural tractors within the range of 12-45 DBHP will rise to 10,000 Nos. per annum by the end of the Third Plan period. The break-up of demand for different ranges likely to be as follows:

	Nos. per annum
12-18 DBHP	3,000
20-30 DBHP	5,500
30 DBHP & above	1,500

Probable year-wise requirements of tractors during the Third Plan period are estimated as under:

	Tractors (Nos.)
1961-62	8,000
1962-63	8,500
1963-64	9,000
1964-65	9,500
1965-66	10,000

The demand for tractors would depend upon the future pattern of mechanised agriculture in the country. Tractors are required for two purposes, *viz.*, reclamation of land and ordinary cultivation. Considering the development of agriculture envisaged during the Third Plan period, the estimates of Working Group have been accepted for development of capacity in this field.

Targets of capacity and production.—For meeting the domestic requirements of 10,000 number of tractors within the range of 12-45 DBHP envisaged by 1965-66, a production target of 10,000 numbers within this range has been fixed. To achieve production level of 10,000 numbers by the end of the Third Plan period, a capacity of 12,000 numbers on double shift has been proposed for establishment by the same period.

Schemes licensed and under implementation.—Licenses have been granted for five units with a capacity of 14,500 tractors.

Details of the scheme are given below:

Name of the firm	Make and size	Annual capacity (Nos.)
M/s. Goodearth Company, New Delhi. [M/s. Eicher Tractor Corporation of India (P) Ltd.]	'Eicher' 12-18 DBHP 20-30 DBHP.	2,000 Nos. with option to manufacture 1,000 Nos. in the 20-30 DBHP range.
M/s. Mahindra & Mahindra Ltd., Bombay.	'David Brown' 12-18 DBHP 20-30 DBHP above 35 DBHP	1,250 1,500 750
M/s. Amalgamations (P) Ltd., Madras [M/s. Tractors & Farm Equipment (P) Ltd.]	'Ferguson' 20-30 DBHP above 35 DBHP.	3,000 500
M/s. Tractors & Bulldozors (P) Ltd., Bombay.	'Zetor' 42 DBHP	2,000
M/s. Ghaziabad Engg. Co. Ltd., Delhi.	'Renault' model N71 upto 35 DBHP.	3,500

As it was desirable that the tractor drawn agricultural implements that were to be manufactured should be matched with the types of tractors proposed for manufacture, all the firms licensed for tractors were also approved for the manufacture of matching implements.

Additional capacity required.—With the implementation of the schemes mentioned above, a capacity of 14,500 numbers of tractors on single shift will become available and it will be possible to achieve higher levels of production through double shift operation. There is no need to license any more capacity in the coming years unless some of the schemes approved for implementation fail to materialise.

Estimates of over-all investment and foreign exchange requirements.—It is estimated that an investment of about Rs. 3·5 crores will be made in this industry during the Third Plan period on the schemes licensed above. The foreign exchange requirement is estimated to be of the order of Rs. 2·0 crores.

The following table summarises the development of power driven agricultural machinery, *viz.*, power driven pumps (centrifugal), diesel engines and tractors during the Third Plan:

	1960-61 ('000 Nos.)	1965-66 ('000 Nos.)
Power-driven pumps (Centrifugal)		
Capacity	128	184
Production	105	150
Diesel Engines		
Capacity	47·68	72
Production	43·24	66
Agricultural Tractors (12-45 DBHP)		
Capacity	Neg.	12
Production	Neg.	10

NOTE.—Capacity target for 1965-66 are on double shift.

ANNEXURE

List of agricultural implements reserved for Small-Scale Units

1. Axes, felling.
2. Axes, pick.
3. Blades, chaff cutters.
4. Cans, ordinary and watering.
5. Channels, watering (sheet metal).
6. Cultivators.
7. Chains for cattle (mild steel).
8. Dusting machines (hand-driven).
9. Draught fans.
10. Earth scrapers.
11. Grain ridders.
12. Graders.
13. Hoes.
14. Harrows and parts thereof.
15. Hedge shears.
16. Kodalis.
17. Persian wheels (peg drive type).
18. Persian wheels except cast iron parts (gear wheel type).
19. Persian wheel parts excluding cast iron parts and including buckets and link chains.
20. Pruning knives.
21. Pans, open boiling.
22. Ploughs complete, including blades, ordinary and improved type.
23. Peg gear driving attachments (hand or cattle driven).
24. Rakes.
25. Ridgers (hand or cattle driven).
26. Rat traps.
27. Spades.
28. Seeders.
29. Seed drillers.
30. Seed dressers.
31. Shovels.
32. Scythes.
33. Sickles.
34. Threshers (hand, paddle or animal driven).
35. Winnowers.

36. Weeders.
37. Weeder Extinguishers.
38. Water buckets.
39. Water lifting equipment, other than persian wheels (hand or cattle driven).
40. Wheel barrow.
41. Wheel, mild steel for carts.
42. All edged hand tools used in agriculture.

List of agricultural implements and machinery to be manufactured by Large-Scale Units

N. B.—All the following implements and machinery are power operated.

(a) Machinery for seed-bed preparation—

(i) Mould-board ploughs (Tractor drawn).
(ii) Disc ploughs (Tractor drawn).
(iii) Disc tillers (Tractor drawn).
(iv) Disc harrows (Tractor drawn).
(v) One-way harrow or harrow plough (Tractor drawn).
(vi) Cultivator or grubber (Tractor drawn).
(vii) Clod crushers, rollers and pulverisers.
(viii) Middle-breakers or listers.
(ix) Sub-soilers.
(x) Rotary ploughs.
(xi) Stack-cutters, tractor drawn.

(b) Seeding and Planting Machinery—

(i) Tractor drawn seed drills.
(ii) Tractor drawn seed-*cum*-fertiliser drills.
(iii) Fertilizer placement machines.
(iv) Row crop seeders, as for cotton, groundnut, maize, etc.
(v) Grain drills for wheat, oats, barley or rice, tractor drawn.
(vi) Grain and seed clearners, graders and seed dressing machinery.
(vii) Potato planters and sugarcane planters.
(viii) Transplanting machines.

(c) Inter-cultivation Machinery, ridgers, etc.—

(i) Tractor drawn ridging ploughs.
(ii) Tractor drawn cultivators including attachments for inter-cultivations, hoeing, etc.

(d) Harvesting and Threshing Machinery—

(i) Tractor drawn moving machines.
(ii) Tractor drawn harvesting machines or reapers.
(iii) Hay baling and straw baling machines or hay presses.
(iv) Hay stackers.
(v) Power-driven threshing machines (about 5 H. P.).
(vi) Power-driven corn shellers.
(vii) Combined harvester threshers.
(viii) Binders (Tractor drawn).
(ix) Cotton-pickers, sugarcane harvesters.
(x) Potato diggers, potato spinners.
(xi) Root crop harvesters such as groundnut diggers.
(xii) Groundnut threshers or pickers.

(e) Dairy Machinery—

(i) Power operated milking machines.
(ii) Automatic milk bottling equipment.
(iii) Complete plants for pasteurisation.
(iv) Manure spreaders, manure loaders.
(v) Milk cooling plant.
(vi) Ensilage cutters—power operated.

(f) Irrigation Machinery—

(i) Centrifugal pumps for irigation from surface wells including power unit.
(ii) Turbine pumps for deep wells (Tube wells).
(iii) Well-boring rings and allied equipment.
(iv) Strainers and pipes required for tube wells.

(g) Terracing and Soil Conservation Machinery—

(i) Graders, dozers and angle-dozers.
(ii) Terracers.
(iii) Drag lines and ditching machines.
(iv) Excavators and scoops.
(v) Mole drainage machines, sub-soilers, etc.

(h) Agricultural Processing machinery—

(i) Rice mills, hullers, shellers, graders and polishers.
(ii) Wheat grinders and wheat milling machinery.
(iii) Groundnut decorticators and oil presses.
(iv) Cotton gins, cotton presses, etc.
(v) Power-driven oil Kohlus.

(vi) Power-driven sugarcane crushers.

(i) Plant Protection Equipment—

(i) Power operated sprayers, dusters and machines for the application of insecticides.

(ii) Dust mixers.

(j) Machinery for storage and preservation—

Cold storage and plants for potatoes.

24. TYPEWRITERS

Typewriter like the telephone is one of the most important necessities in the present form of organisation of commercial, economic and social activities of every country. It forms an essential equipment in the administrative offices attached to the different agencies functioning in divergent fields without which the tempo of activity will be very much slowed down.

1. Brief Survey of the Industry :

Typewriters are of two types: (a) standard typewriters and (b) portable typewriters. Standard typewriters at present manufactured in the country are made in different carriage lengths varying from 11" to 27" out of which the sizes 11" to 15" are most popular. At the beginning of the Second Plan, there were three units manufacturing typewriters with an installed capacity of 33,000 Nos. per annum. Another unit, *viz.*, M/s. Blackwood (India) Ltd. Calcutta came into production since July 1960, with a capacity of 12,000 Nos. per annum. Thus, there are at present four units with a total installed capacity of 45,000 typewriters per annum on single shift basis.

M/s. Remington Rand of India Ltd., Calcutta, who are the pioneers in this field, manufacture standard typewriters of different carriage lengths with keyboards in English and other vernaculars such as Bengali, Marathi, Gujarati, Hindi, Assamese and Tamil. Their licensed capacity is at present 15,000 typewriters per annum. They are, however, in a position to manufacture 18,000 typewriters per annum with their existing capacity. The indigenous content in these typewriters is about 80 per cent at present, and the pack value of imported components per typewriter is about Rs. 97.

M/s. Rayala Corporation Ltd., Madras, are the manufacturers of Halda typewriters (standard) in collaboration with M/s. Atvidaberg Industries, Stockholm, Sweden. It is producing typewriters with English, Hindi and Tamil Keyboards. Their present annual installed capacity is 6,000 machines. The indigenous content has now risen to 83 per cent corresponding to a pack value of Rs. 72 per typewriter.

M/s. Godrej & Boyce Co., Bombay, produce standard typewriters with English keyboard only. It has hitherto been manufacturing typewriters without any foreign collaboration with an installed capacity of 12,000 typewriters per annum and with 95 per cent indigenous content right from the beginning. The value of the imported components per machine is only Rs. 28. The firm has recently entered into an agreement with M/s. Veb Optima Erfurt of G. D. R. for technical collaboration, based on which it proposes to manufacture typewriters of different carriage lengths with English and Hindi keyboards.

M/s. Blackwoods (India) Ltd. Calcutta, is the only unit manufacturing portable typewriters. Its installed capacity is 12,000 typewriters per annum. The pack value of imported components per machine is about Rs. 23.

Production.—The production of typewriters during the last few years has been as follows:

	Production (Nos.)	
	Standard	Portable
1956	13,620	..
1957	15,430	..
1958	15,846	..
1959	21,437	..
1960	22,239	1,310

There was continuous increase in the production of typewriters and the increase in 1960 is due to an additional unit coming into production in that year. The present production of M/s. Remington Rand of India Ltd., Calcutta has exceeded their licensed capacity of 15,000 Nos. per annum. M/s. Rayala Corporation, whose production was low due to labour unrest in their factory have now stepped up their production to nearabout the installed capacity & M/s. Godrej & Boyce Co. Ltd. Bombay, have not been able to increase their production so far due to their quality not being comparable with that of other manufacturers.

Imports & Exports.—At the beginning of the Second Plan the import of typewriters was allowed upto 25 per cent general and 75 per cent from soft currency areas. This quota was reduced to 40 per cent under the October-March, 1959 import policy. From the period April 1959-September 1959 there has been a ban on import of typewriters.

The actual import of typewriters during the last few years has been as under:

	Number	Value	Value of imported components
		(Rs. lakhs)	(Rs. lakhs)
1956	34,219	122·5	11·73
1957	28,160	87·1	112·83
1958	4,201	10·8	36·78
1959	407	1·6	29·92
1960	188	1·5	35·14

The imports of typewriters originated from the United Kingdom, Italy and Switzerland. They have come down to a negligible figure since 1959.

Exports.—Due to heavy internal demand, there was no incentive for the manufacturers to export typewriters. Nominal exports were, however, made to Nepal, Afghanistan, Pakistan, Ceylon, Iran and Burma. The actual exports of typewriters during the last few years have been as under :

	Nos.	Value (Rs. lakhs)
1957	121	0·85
1958	38	0·23
1959	52	0·41
1960	63	2·39

Availability.—The number of typewriters available for sale during the last few years based on actual production plus imports minus exports, has been as follows :

	Production (Nos.)	Imports (Nos.)	Exports (Nos.)	Availability (Nos.)
1956	13,620	34,219	..	47,839
1957	15,430	28,160	121	43,469
1958	15,846	4,201	38	20,009
1959	21,437	407	52	21,792
1960	23,549	188	63	23,674

The availability of typewriters was continuously falling uptil the year 1958. Only in the last two years of the Second Plan, there has been improvement. Before the ban was placed on the import of typewriters, India normally imported on an average about 21,000 standard and about 7,000 portable machines every year. With the unprecedented expansion of industrial and commercial activities and the further fact that the old machines are being replaced far more often than in the past, it is considered that the actual requirements of standard machines could be placed at about 35,000 numbers and portable at 10,000 numbers in the last year of the Second Plan.

If all the three units making standard machines and the Blackwoods making portable typewriters, maintain their output near their installed capacity, the country could have met its requirements fully from internal sources. In actual practice, a shortage has developed in the country due to the low level of capacity utilisation on the part of two of the producers. In the context of the shortage of machines, enterprising mechanics, either in regular employment with the manufacturing firms or working on their own, have developed their own methods of meeting the demand by resurrecting worn out machines from the junk heaps. Pressing chromium plating and spray painting operations into full use, machines manufactured some 30 years ago and condemned in the last decade have been reconditioned and put on the market at prices varying from Rs. 400 to Rs. 850. Initial investment in the purchase from junk lots is placed at between Rs. 50 and 60 per discarded machine. After, allowing the cost of repairs and refinishing, the sale price realised is stated to be still yielding a profit of nearly Rs. 125 per machine. Against the background of such financial returns, mechanics and salesmen have been reported to be actively concentrating to the reconditioning and sale of these rebuilt machines.

Prices.—The prices of typewriters are charged differently depending on the categories of consumers. The consumers have been divided into:

(a) Government,
(b) Educational and charitable institutions,
(c) General public.

The prices currently charged for the different sizes of typewriters for the different categories of consumers are as under:

Typewriter	Size	Selling Price		
		Government	Educational and charitable Institutions	General public
		Rs.	Rs.	Rs.
Remington	11"	745·00	921·42	1,272·00
	15"	820·00	1,017·14	1,389·00
	20"	1,008·00	1,242·14	1,741·00
	27"	1,294·00	1,523·00	2,214·00
Halda	11½"	695·00	850·00	1,050·00
	15"	795·00	930·00	1,229·00
	17½"	895·00	1,100·00	1,400·00
Godrej	14"	700·00	700·00	760·00

From the above figures, it will be seen that while there is only a little variation between the prices charged to the Government and the public for typewriters manufactured by M/s Godrej & Boyce, Bombay, the divergence in the case of Remington and Halda products is very large.

Typewriters in the Small Scale Sector.—In the Small-scale sector, a scheme of M/s. Teekayes & Sons (Agents) New Delhi (later changed to M/s. Quality Office Appliances Private Ltd. New Delhi) was approved by the Ministry of Commerce and Industry in July 1960. The scheme involves collaboration with Messrs. Voss Schriebmaschinen fabrik Wuppertal Berman, Germany, for the manufacture of about 2,000 typewriters per annum. They are yet to start production. The factory will be located at Bahadurgarh, Punjab. The phased manufacturing programme was approved by Government in July, 1961.

II. Programmes of Development in the Third Plan:

Estimated requirements.—As explained earlier, the effective demand for typewriters is estimated at 45,000 numbers by the end of the Second Plan. With the industrial development and expansion of trade and tempo of activities under education and other spheres of social advance, the demand for an article like typewriter would register substantial expansion. Based on consensus of opinion of the interests engaged in this field, it is felt that the demand for typewriters can be expected to expand 100 per cent over the 1960-61 level, reaching 90,000 units.

Export possibilities.—In the case of typewriters, as in the case of many other durable consumer goods, customer preference is of considerable importance. In order to effect exports, quality of the typewriter is also vital apart from the price factor. Given satisfactory improvement in regard to both these aspects in the context or rising levels of production to meet

the internal demand, it is envisaged that exports of about 10,000 numbers could be reckoned in 1965-66. The overall demand for typewriters by 1965-66 is thus placed at 100,000 numbers.

Target of capacity and production.—In the light of the estimated internal and external demand of one lakh typewriters, it is considered that the target for capacity and production in the large-scale sector would have to be visualised at one lakh machines and 90,000 machines respectively per annum on the basis of double shift operation of the capacity and reckoning 80 per cent of the capacity output in the second shift. A further 10,000 Nos. are expected to be produced in the small-scale sector per annum, thus giving overall output of 100,000 machines in the last year of the Third Plan.

Schemes licensed and under implementation.—A few schemes which will increase the capacity of the industry have been licensed under the Industries (D & R) Act as detailed below :—

M/s. Rayala Corporation Ltd. Madras.—This unit has recently been granted a licence for expansion of their annual capacity from 6,000 Nos. to 14,400 Nos. (standard type) and an additional 6,000 Nos. for portable typewriters as a new article. To begin with, in the case of portable typewriters, the indigenous content would be 66 per cent of the C.K.D. value of the complete typewriter. The percentage would rise to 83 per cent in about six months time after the commencement of productions.

M/s. Rai Sons Ltd., New Delhi.—The scheme of M/s. Rai & Sons. Ltd. New Delhi for the manufacture of 10,000 standard typewriters on double shift in collaboration with Messrs. Kovo, Praba, Czechoslovakia, a sister concern of Skoda, has been approved in March 1961. It is still in the preliminary stage of development.

Additional capacity required.—Assuming the implementation of both the schemes cleared recently by Government, the capacity of the industry will stand at 64,400 numbers per annum in the large-scale sector on single shift and 2,000 numbers annualy in the small-scale field. It is considered that this capacity will be adequate to meet the estimated demand in 1965-66, if operated on a double shift basis and the possibilities of working the installed capacity of the industry on double shift basis should be fully gone into before creation of new capacity in this field. The possibilities of development of any further capacity in the small-scale sector within the overall target for the Third Plan can be considered only after examining the economics of production of the unit licensed which has not yet started production.

The following table summarises the programme of development of the typewriter industry during the Third Plan:

	1960-61 (Nos.)	1965-66 (Nos.)
Capacity	45,000	100,000
Production	23,549	100,000*
Exports	63	10,000

*Includes 10,000 nos. expected to be produced by the Small Scale Sector.

25. BICYCLES

1. Review of Progress in the Second Plan:

Targets.—At the time of the formulation of the Second Plan, it was envisaged that the domestic demand for bicycles would rise to 11 lakhs per annum by 1960-61. Allowing another 1·5 lakhs for exports, a production target of 12·5 lakhs was fixed for this industry for the final year of the Second Plan. The capacity of the industry which was expected to increase to 8·95 lakhs per annum on single shift was considered to be adequate for the realisation of the production target.

Organised Sector

Capacity.—In April 1956, there were 14 units engaged in the manufacture of bicycles with an annual capacity of 627,500 cycles. Since then, seven new units with a capacity of 146,500 bicycles have gone into production and substantial expansions of capacity accounting for 368,500 bicycles have been effected in seven existing units. One of the existing units, *viz.*, M/s. Nundy & Co., discontinued the manufacture of complete bicycles in 1958. At the end of 1960-61, there were thus twenty units engaged in the manufacture of bicycles with an annual installed capacity of 1,117,500 cycles on single shift basis.

Details of the schemes which were completed during the Second Plan period are given below:

Name of the Unit	Nature of Scheme	Annual capacity as on 1-4-56 (Nos.)	Annual capacity as on 1-4-61 (Nos.)	Increase in capacity (Nos.)
1	2	3	4	5
M/s. Metal Goods Mfg. Co. Ltd., Varanasi	New Unit	..	15,000	15,000
M/s. Hero Cycle Industries, Ludhiana	,,	..	7,500	7,500
M/s. Road Master Industries of India Ltd., Rajpura	,,	..	25,000	25,000
M/s. Zenith Cycle Industries, Delhi	,,	..	24,000	24,000
M/s. Steelsons Ltd., Modinagar	,,	..	20,000	20,000
M/s. Parkash Engg. Co., Lucknow	,,	..	15,000	15,000

1	2	3	4	5
M/s. Everest Industrial Corpn., Gauhati .	New Unit	..	40,000	40,000
M/s. Atlas Cycles, Sonepat . . .	Substantial Expn.	100,000	200,000	100,000
M/s. Sen Raleigh Industries of (I) Ltd., Calcutta	,,	100,000	200,000	100,000
M/s. Pearl Cycles, Delhi . . .	,,	24,000	32,000	8,000
M/s. Avon Cycles, Ludhiana. . .	,,	6,000	24,000	18,000
M/s. Hindustan Vehicles Ltd., Patna .	,,	7,500	30,000	22,500
M/s. T. I. Cycles, Madras . . .	,,	100,000	200,000	100,000
M/s. Gopal Metal Works, Lucknow .	,,	20,000	40,000	20,000

The State-wise distribution of capacity as on 1-4-56 and 1-4-61 of the units registered with the Development Wing is given below:

State	Capacity as on 1-4-56		Capacity as on 1-4-61	
	No. of Units	Capacity (Nos.)	No. of Units	Capacity (Nos.)
Maharashtra	1	100,000	1	100,000
Bihar	1	7,500	1	30,000
West Bengal	3	155,000	2	230,000
Madras	1	100,000	1	200,000
Punjab	4	186,000	6	336,500
Uttar Pradesh	3	55,000	6	125,000
Delhi	1	24,000	2	56,000
Assam	..	..	1	40,000
TOTAL .	14	627,500	20	1,117,500

Production.—The production of bicycles in the organised as well as decentralised sectors, since 1955-56 is given below :

	Production (Lakhs)	
	Large scale sector	Small scale sector
1955-56	5·13	..
1956-57	7·35	0·26*
1957-58	8·49	1·11*
1958-59	8·94	1·71*
1959-60	10·28	1·73*
1960-61	10·57	2·5

*Relates to calendar year.

The bicycle industry has made considerable progress during the Second Plan period. The production has shown a progressive increase over the 1955-56 level. The achievements of capacity and production have exceeded the Second Plan targets.

Imports.—The imports of bicycles since 1956 are given below :

	Import (Nos.)
1956	154,000
1957	92,000
1958	7,000
1959	700
1960	492

It will be observed that there has been a sharp fall in imports of bicycles since 1958 which has been made good by the expansion of indigenous production.

Exports.—The export of bicycles since 1956 is as under :

	Export (Nos.)
1956	..
1957	286
1958	396
1959	7,573
1960	4,129

It will thus be seen that notwithstanding the measures taken like the formation of export pool etc. the target forecast set in the Plan for the export of 150,000 cycles in 1960-61 has not been achieved. This is partly due to the domestic industry being still in the stage of expansion and dependent on imports not only for certain main components but also a wide range of raw materials. Competition from certain Far East and East European countries whose prices were lower, was also a retarding factor.

Consumption.—Internal demand for bicycles has shown a steady rise. The internal demand obtained by adding the imports and indigenous production (both large and small-scale sectors) minus exports, has shown a more or less steady increase during the five-year period. The position in this regard is indicated below :

(Figures in lakhs)

	Production		Imports	Exports	Consumption
	Large-scale sector	Small-scale sector			
	1	2	3	4	5
1955-56	5·13	..	1·30	..	6·43
1956-57	7·35	0·26	1·54	..	9·15
1957-58	8·49	1·11	0·92	0·003	10·52
1958-59	8·94	1·71	0·07	0·004	10·72
1959-60	10·28	1·73	0·007	0·075	11·94
1960-61	10·57	2·5	0·005	0·041	13·03

NOTE.—Production figures for the small-scale (except for 1960-61), imports and exports figures relate to calendar years.

Cycle Export Pool.—The Cycle Manufacturers Association of India has, with effect from 1st January, 1959 created a Cycle Export Pool for assisting its members in finding export outlets for their products. The funds of the pool are raised by contribution from members at the rate of 0·3 per cent of the value of bicycle turnover (past year's production multiplied by the average price) in the case of bicycle manufacturers and of the value of total sales (past year's sales multiplied by the average price) in the case of components and/or accessories manufacturers. The members of the pool who export complete bicycles and components and/or accessories get reimbursed out of the funds of the pool at the rate of 20 per cent of the total value of the wholesale selling price of the bicycles exported or the internal total sales value of components in the case of components and/or accessories exported.

Quality of Indigenous Product.—In their 1960 Report the Tariff Commission pointed out that there has been considerable improvement in recent years in the quality of indigenous bicycles. The manufacturers have made satisfactory arrangements for inspection and are also taking keen interest in modern methods of quality control and techniques of manufacture.

Investment.—A sum of about Rs. 375 lakhs is estimated to have been invested by the large-scale manufacturers of bicycles on plant, machinery, land and buildings during the Second Plan period.

Employment.—About 12,000 workers were employed in the large-scale sector of bicycle industry at the end of the Second Plan as against 6,000 employed at its beginning.

Progress in the manufacture of parts and accessories.—Besides large-scale bicycle manufacturing establishments, some of which have capacity surplus to their own requirements, there are units which manufacture components only in both the large and small-scale sectors. While at the beginning of the Second Plan there were 22 large-scale units producing parts and accessories of bicycles, there were in 1960-61, 51 units licensed to manufacture components and out of these, 26 were in actual production. The production of parts and accessories is estimated to have increased from Rs. 2·32 crores in 1956 to 5·07 crores in 1960.

The State-wise distribution of units manufacturing parts in the large-scale sector was as under :

State	No. of Units
Delhi	5
Gujarat	2
Kerala	1
Maharashtra	3
Punjab	4
Madras	1
Uttar Pradesh	3
West Bengal	7

Development Council.—The Government of India constituted a Development Council for the bicycle industry in 1953 which was expanded in 1958 to cover besides bicycles, sewing machines and instruments. The Council's activities have been mainly aimed at bringing about an increase in production, improving the quality of bicycles and promoting exports etc. The Council has also made recommendations about the formulation of programme of development of this industry for the Third Plan period.

Tariff Protection.—The protection which this industry had been enjoying since 1946 has been extended upto 31st December 1963 on the Government's acceptance of the recommendations of the Tariff Commission in 1960. The rate of import duty has been revised to 65 per cent *ad valorem* or Rs. 80 per cycle whichever is higher, on cycles of British manufacture and in respect of cycles of Non-British manufacture, to the rate actually charged at the time for such products of British manufacture plus 10 per cent *ad valorem*. For frames of cycles, handle bars, roller chains of 12·7 mm. × 3·175 mm.

and 12·7 mm. × 4·7625 mm., all other parts and accessories of cycles not otherwise specified, the rate of duty has been fixed at 65% *ad valorem* on products of British manufacture and 75% in respect of non-British manufacture

Bicycle Industry in the small-scale sector.—The bicycle industry in the small-scale sector has made considerable progress during the Second Plan period. A target of 2·5 lakh cycles fixed for the small-scale sector by the end of the Second Plan period is estimated to have been achieved. The annual sanctioned production capacity of the approved small-scale units has increased from 2·07 lakhs in 1956 to 8·40 lakhs in the beginning of 1961. There were 150 units in 1960 on the list of the Development Commissioner, Small-scale Industries as against 130 units in 1958. In 1956 when an approved production programme for small-scale sector was started, the bicycle industry was mainly situated in the States of Delhi, Punjab, West Bengal, Bombay and Uttar Pradesh. Since then, units have come into existence in all the States of Indian Union.

At the beginning of the Second Plan the total number of small-scale units engaged in the manufacture of parts and components was estimated at about 460. These were largely concentrated in the Punjab, Delhi, West Bengal, Bombay and U. P. However, according to a survey of these units carried out in 1955 and 1956, the total number was estimated at 612 units, of which 441 were in Northern region, 120 in Eastern region, 34 in Southern region and 17 in the Western region.

Problems of the small-scale sector.—While the small-scale sector has also grown along with the larger units, the problems at present faced by it are mainly in regard to lack of modern technical know-how, poor testing facilities and difficulty in getting the right type of raw material. Through its Small Industries Service Institutes and Extension centres in each State, the Small-Scale Industries Organisation renders technical assistance to the bicycle assemblers and manufacturers of parts and accessories. Further, the National Small Industries Corporation has been supplying machinery to small-scale manufacturers under hire-purchase programme on easy repayment terms and uses its good offices to persuade large-scale units to obtain their requirements of components and parts from the small-scale sector.

II. Programme of Development in the Third Plan:

Estimated requirements.—The Development Council for the Bicycle Industry has recommended a production target of 2·5 million cycles per annum by 1965-66. The Council has also mentioned that out of 2·5 million cycles by 1965-66, the large and small-scale sectors should produce 2·0 million and 0·5 million cycles respectively. It can be reasonably expected that in the coming years the off-take of bicycles will go up appreciably as a result of an increase in the standards of living. The construction of a network of new roads and expansion of trading opportunities and urbanisation will also stimulate the demand for bicycles. In view of these factors, the internal demand for bicycles is anticipated to rise from about 1·3 million at the end of the Second Plan to about 2·3 million cycles in 1965-66. Considering the various measures taken for export promotion, an export target

of 2 lakh bicycles is envisaged for the last year of the Third Plan. Thus the total requirements of bicycles is expected to rise to about 2·5 million numbers at the end of the Third Plan period. The levels of requirements in each year of the Third Plan have been estimated as follows:

	Indigenous demand ('000 Nos.)	Export ('000 Nos.)	Total requirements ('000 Nos.)
1961-62	1,500	50	1,550
1962-63	1,700	75	1,775
1963-64	1,900	100	2,000
1964-65	2,100	150	2,250
1965-66	2,300	200	2,500

Targets of capacity and production.—For meeting the domestic and export requirements envisaged by 1965-66, an output of 2·5 million bicycles is necessary. This output is sought to be achieved through the organised sector as well as the decentralised sector of the industry. In view of the considerable employment potentialities of the small-scale sector, adequate encouragement has to be given to the development of this sector of the industry which should enable to produce about 0·5 million bicycles per annum by 1965-66. The balance of 2 million bicycles is expected to be produced by the large-scale units. To achieve this production level of 2 million bicycles in the large-scale sector by 1965-66, a capacity of 2·2 million bicycles on double shift basis has been proposed for establishment.

Schemes licensed and under implementation.—Licences have been granted for establishing one new unit with a capacity of 30,000 bicycles and substantial expansion of three units with a capacity of 150,000 bicycles, giving altogether an additional capacity of 180,000 bicycles. Details of the schemes are given below :

Name of the unit	Nature of the Scheme	Capacity at the end of 1960-61 ('000 Nos.)	Addl. capacity licensed ('000 Nos.)	Annual capacity when the schemes are implemented ('000 Nos.)
M/s. Indian Malleable Castings Ltd. Calcutta	New Unit	..	30	30
M/s. T. I. Cycles of India Ltd., Madras	Substantial Expn.	200	100	300
M/s. Hindustan Vehicles Ltd., Patna	,,	30	30	60
M/s. Everest Industrial Corporation, Gauhati	,,	40	20	60

The investment required for the implementation of the expansion schemes mentioned above have been made almost entirely by the close of the Second Plan though the capacity has not been taken into reckoning.

Additional capacity required.—With the implementation of all the schemes mentioned above, the rated capacity of the industry is expected to increase from 1,117,500 to 1,297,500 bicycles per annum on single shift. Even if M/s. Indian Malleable Castings Ltd., which is reported to have made no progress, does not come into production, by working the remaining capacity on multiple shift, a production level of 2·0 million bicycles can be achieved by the end of the Third Plan period by the large-scale sector of the industry and there is no need to license any more capacity in the coming years.

Investment and Employment.—As the potential capacity of the large-scale sector is sufficient to meet the anticipated demand during the Third Plan, no major investment is envisaged in this industry during the Third Plan.

Since there will not be much expansion in the bicycle industry during the Third Plan period, the employment potentialities in this industry will not increase. As the existing units are expected to work on double shift the employment under this industry may rise from about 12,000 workers to about 15,000 workers by 1965-66.

Requirements of raw materials.—The principal raw materials required by the bicycle industry are steel items, such as tubes, strips, bars, wires and sheets. Tubes, sheets and black bars are available indigenously. The requirements of strips, free cutting bars and wires are largely met by imports. Besides steel items, the other raw materials are: brass for brazing, brass wires for nipples, and copper, nickel and chromium anodes. Brass wires and anodes are imported and brass for brazing is available indigenously. The industry also requires a number of consumable stores including chemicals for polishing, brazing, electro-plating and heat treatment. The bulk of these items is imported. By 1965-66 the industry is expected to be self-sufficient in most of the above items. Some consumer stores like nickel anodes and electrolytic materials may have to be imported even at the end of the Third Plan.

The steel requirements of the large scale sector of the industry during 1960-61 and 1965-66 are as follows:

	1960-61	1965-66
1. Steel tubes (tons)	4,000	8,000
2. M. S. Steel sections of various categories for manufacturing components (tons)	16,000	32,000

The following table summarises the development of the Bicycle industry envisaged under the Third Plan:—

	1960-61	1965-66
No. of units	20	21
Capacity (Nos.)	1,117,500†	2,200,000‡
Production (Nos.)	1,307,000*	2,500,000*

*Includes both large and small-scale sectors.

† On single shift basis.

‡ On double shift basis.

26. SEWING MACHINES

I. Review of Progress in the Second Plan:

Targets.—The Planning Commission estimated that the requirements of sewing machines would be 300,000 per annum by 1960-61, of which 80,000 domestic sewing machines were expected to be produced by the small-scale sector. An export target of 30,000 was laid down for the year 1960-61.

It was considered that a capacity of 85,200 machines per year on a single shift basis would be sufficient to produce 220,000 machines visualised in the organised sector in 1960-61.

Capacity and production.—There were 3 units engaged in the manufacture of sewing machines with a total capacity of 46,500 per annum in the organised sector at the beginning of the Second Plan. During the period of the Second Plan, 2 new units with a total capacity of 3,700 numbers came into existence. One of the existing units carried out substantial expansion. Three units *viz.* M/s. Pansar Mechanical Works, Ludhiana, M/s. C. R. Alullick and Sons, Ludhiana and M/s. Rita Mechanical Works, Ludhiana, were added to the list of registered manufacturers; these had previously been working as small-scale units.

Details of the schemes completed during the Second Plan period are given below:

Name of the Unit	Nature of Scheme	Annual Capacity as on 1-4-56 (Nos)	Annual Capacity as on 1-4-61 (Nos)	Date of commencement of production or Completion of expansion
M/s. Jay Engineering works Ltd., Calcutta	Expansion	40,000	86,000	1960
M/s. Pansar Mechanical Works, Ludhiana	Small-Scale Unit	..	11,000	1957
M/s. C. R. Alullick and Sons, Ludhiana	Small-Scale Unit	..	12,000	1959
M/s. Jagat Bandu (Reg.), Amritsar	New Unit	..	700	1957
M/s. Lotus Industries, Howrah	New Unit	..	3,000	1957
M/s. Rita Mechanical Works, Ludhiana	Small-Scale Unit	..	16,000	1960

With the closure of M/s. K. C. Mullick, Bhubneshwar, which had a capacity of 1,500 sewing machines, the installed capacity of the industry stood at 133,700 numbers reckoned on single shift basis at the end of the Second Plan.

The State-wise distribution of the industry is as follows:

State	Number of Units	Annual capacity (Numbers)
West Bengal	2	89,000
Punjab	4	39,700
Delhi	1	5,000
TOTAL	7	133,700

Production of sewing machines in the last six years has been as follows :

	Production (Numbers)
1955-56	111,057
1956-57	140,956
1957-58	173,966
1958-59	232,090
1959-60	266,674
1960-61	297,300

The production of sewing machines has shown an increase of 25% per year during the period of the Second Plan. Taking into account 50,000 sewing machines estimated to have been produced in the small-scale sector, the total production has exceeded the target of 300,000 numbers laid down for the Second Plan.

Import policy and Imports.—At the beginning of the Second Plan imports of domestic sewing machines were allowed to the extent of 20 per cent of the best year's imports, while parts of sewing machines were allowed to the extent of 15 per cent; but at the present time imports of domestic sewing machines and parts are completely banned. Only applications from approved assemblers and other actual users are considered on an *ad hoc* basis.

In the year 1956, imports of industrial sewing machines were allowed to the extent of 20 per cent general and 100 per cent from soft currency areas, but new imports of Industrial sewing machine are also totally banned. The parts are, however, allowed upto 10 percent general and 10 per cent from the soft currency areas.

There are over 300 parts in a sewing machine out of which the following 11 parts are at present being imported by the units in the large as well as small-scale sector :—

1. Oscillating rock shaft.
2. Face plate.
3. Arm side cover.
4. Bobbin Case.
5. Needle bar long size.
6. Pressure foot.
7. Link with stud.
8. Square roller.
9. Thread take up lever.
10. Shuttle.
11. Shuttle carrier with spring.

Imports of sewing machines during the last five years has been as follows:

	Quantity (Number)	Value (Rs. lakhs)	Parts (Value Rs. lakhs)
1956	29,513	55·17	31·15
1957	23,549	61·60	24·13
1958	5,007	18·50	4·49
1959	1,012	5·58	11·06
1960	1,124	8·57	31·54

Due to increase in internal production, import of complete sewing machines has come down to a nominal figure, and this includes only those special types which are not at present being manufactured in the country. Import of sewing machine parts has shown an increasing trend due to some more small-scale units coming into production in the small-scale sector.

Exports.—Exports of sewing machines in the last five years have been as follows:

	Quantity (Number	Value (Rs. lakhs)	Parts (Value Rs. lakhs)
1956	3,415	4·65	..
1957	4,465	5·49	10·52
1958	9,734	15·07	5·09
1959	22,764	24·12	7·86
1960	25,952	26·57	32·26

During the period of the Second Plan exports have shown a substantial increase. Most of the sewing machines exported from this country go to Singapore, Afghanistan, Thailand and Mauritius.

Consumption.—The availability of sewing machines on the basis of domestic production plus imports minus exports during the Second Plan are summarised in the table below:

	Production (including Small Scale) (Nos.)	Imports (Nos.)	Exports (Nos.)	Quantity available for indigenous market (Nos.)
1955-56	133,057	13,721	4,292	142,486
1956-57	164,559	29,513	3,415	190,657
1957-58	198,774	23,549*	4,465	217,858
1958-59	263,585	5,007*	9,734*	258,858
1959-60	305,075	1,012*	22,764*	283,325
1960-61	347,300	1,124*	25,952*	322,472

*Figures are for calendar year.

It will be observed that the number of domestic and industrial sewing machines available for the domestic market is about 52,000 higher than the figure of 270.000 envisaged in the Plan.

Indigenous products Vs. *Imports.*—This has to be considered in respect of the following categories:—

(i) Domestic sewing machines.

(ii) Components and spare parts.

The imports of sewing machines has come down from 29,513 numbers in 1956 to 1,124 in 1960. Since October, 1957 imports of domestic sewing machines have been completely banned. There is, therefore practically no competition between the indigenous and imported product. The difference of price between the two types of machines is also very great, the indigenous machine being decidely cheaper. Imported domestic sewing machines may, therefore practically be considered to have vanished from the market.

Comparative prices of the imported and indigenous sewing machines

	Hand operated machines	Treadle operated machines
	Imported Machines	
Singer (of Great Britain)	Rs. 365 to 600 (Electric protable machine without cover cost Rs. 620 to 775)	Rs. 515 to 765
Judi, Yamato, Jukihai Happy, Excellsior (of Japan)	Rs. 185 to 375	Rs. 350 to 600.
Pfaff (of West Germany)	Rs. 455 to 565	Rs. 560 and upward.
	Indigenous Machines	
Both large and small scale	Rs. 155 to 210	Rs. 205 to 285.

Among the imported machines of domestic types, those from Japan enjoyed better demand than Singer and Pfaff machines in view of their comparatively cheaper price.

In regard to quality, the indigenous sewing machines compare favourably with the imported machines.

Components and spare parts.—Till January-June 1957 when import of spare parts was allowed on 5 percent quota to established importers, there was competition from Japan because of their superior quality. The preference for Japanese parts is still in evidence. But with the complete ban on the import of spare parts, except those that are not produced by the Small-Scale sector for which *ad hoc* licences are issued to approved assemblers and other actual users from soft currency areas including Japan, this competition is very much reduced.

Sewing machine needles and the scope for their indigenous manufacture.—Sewing machine needles are imported from Japan, Germany and Czechoslovakia. The import of these needles was allowed on 60 per cent quota to established importers during January-June 1957. By the end of the Second Plan, this quota was reduced to 12½ percent. These needles imported from foreign countries are of superior quality and have hitherto been much preferred in the market to the needles manufactured in the country. M/s. Jay Engineering Works Ltd., Calcutta, have installed a needle manufacturing plant at a cost of about Rs. 7 lakhs and production started in 1958. With this new plant of M/s. Jay Engineering Works it is expected that needles of better quality than have so far been manufactured will begin to be produced in the country.

Sewing machine industry in the small-scale sector.—The assembly of sewing machines started in the small-scale sector at about the beginning of the Second Plan. It was envisaged that this sector would produce 80,000 sewing machines by 1960-61. As against this target, production programmes for 123,000 sewing machines have already been approved. The

actual production achieved in the small-scale sector has been placed at 23,603 in 1956, 24,808 in 1957, 31,495 in 1958, 38,401 in 1959 and is estimated to be 50,000 in 1960.

This industry is mainly concentrated in the States of Punjab and Delhi, but recently it has also begun to take root in Andhra Pradesh, Madhya Pradesh, Bombay, Jammu and Kashmir, U.P. and Rajasthan.

The Small-scale producers are currently allowed to import 11 components with a maximum value of Rs. 10 per sewing machine. Some of the units have already started manufacturing certain complicated items which are at present being imported such as face plate, arms, side cover, pressure foot and oscillating rock shaft.

Besides domestic sewing machines, industrial sewing machines are also assembled in the small-scale sector.

There is general complaint that in the case of the products of the small-scale units, the parts required for replacement are not easily available and this adversely affects their sales.

Investment and employment.—It is estimated that the investment in this industry during the period of the Second Plan has been about Rs. 30·0 lakhs. The employment at the end of 1960-61 stood at about 4,500.

II. Programme of Development in the Third Plan:

Estimated demand.—The demand for sewing machines depends upon the level of income, the total consumption of cloth and the consumption of leather goods and footwear especially shoes. In addition the present system of marketing on hire-purchase basis—adopted by both the large-scale and the small-scale manufacturers is a factor which has boosted the demand for sewing machines.

As explained earlier, the indigenous demand for domestic and industrial sewing machines increased by 25 per cent per annum during the period of the Second Plan. With the increase of *per capita* Income from Rs. 330 to 385 and increase of consumption of cloth from 6,550 million yards to 8,450 million yards, it is envisaged that this rate of increase of demand during the Second Plan period will be maintained during the period of the Third Plan as well. On this basis, it can be projected that the demand for domestic and industrial sewing machines will increase from 322,000 numbers in 1960-61 to 725,000 numbers by the end of the Third Plan.

The outlook for expanded exports of sewing machines from this country in the next few years is also rated as bright. Nearly 3 to 3·5 million sewing machines figure in the annual international trade, with Japan the leading exporter accounting for 2·0 million sewing machines. The world demand for this item is not expected to show signs of abatement, particularly in the context of the newly emergent African nations. The American Market, which is at present the largest single market in the world for this item is also opening up for Indian sewing machines. Recently a licence has been granted to M/s. Jay Engineering Works for setting up a

plant with a single shift capacity of 100,000 numbers subject to the condition that 90 percent of the output will be exported. In these circumstances, if the increase in exports can maintain the same tempo as under the Second Plan period, it can be envisaged that the exports will increase from about 26,000 numbers to about 125,000 numbers by the end of the Third Plan.

Thus the total demand of sewing machines will be of the order of 850,000 numbers by 1965-66.

Target of capacity and production.—Out of the estimated supplies of 8·5 lakhs of sewing machines, production of 150,000 domestic sewing machines is envisaged in the small scale sector. The share of the large-scale sector is visualised at 700,000 sewing machines by 1965-66.

At the end of the Second Plan, with a production of 297,000 sewing machines by the large-scale sector, the ratio of capacity to production was about 1:2·2. Accordingly, in order to produce 700,000 sewing machines, an installed capacity of 350,000 numbers reckoned on a single shift should be adequate for the Third Plan. Additional capacity for 216,000 sewing machines on a single shift basis will have to be brought into existence to match the production target for the organised sector.

Schemes licensed and recommended for licence.—The position of the schemes which have already been licensed and are yet to be implemented and schemes further sanctioned are given below:

Name of the firm	Items proposed to be manufactured	Single shift capacity per annum (Nos.)
M/s. Jay Engineering Works, Calcutta	Industrial Sewing Machines	14,000
M/s. Mahabir Import and Export, Delhi	Industrial Sewing Machines	12,000
	Domestic Sewing Machines	5,000
M/s. Sharda Machinery Corporation, Madras	Industrial Sewing Machines	24,000
	Domestic Sewing Machines	18,000
M/s. Jay Engineering Works, Hyderabad	Zig Zag Sewing Machines	100,000

The output from the new plant of M/s. Jay Engineering Works is visualised in its ultimate phase at 3 lakh machines on triple shift operation.

With the implementation of the above schemes, the installed capacity of the industry will stand at 306,700 numbers per annum on single shift working.

Future Development of the Industry.—With the completion of the schemes under implementation the State-wise distribution of the industry will be as follows:

State	No. of units	Annual capacity (Numbers)
West Bengal	2	103,000
Delhi	1	22,000
Punjab	4	39,700
Madras	1	42,000
Andhra	1	100,000
TOTAL	9	306,700

This capacity should be sufficient if the new units licensed almost wholly from the export angle were to operate on three-shift basis, as has been planned. It will be short of requirements if capacity is proposed to be planned for achieving the production target on an overall double shift operation of the industry. In filling the gap *vis-a-vis* the requirement of an installed capacity of 350,000 sewing machines on single shift basis, it is essential to give full scope for the expansion of the smaller units. It is also desirable that the industry should expand in the south where only one unit is expected to come into production during the Third Plan period, on the basis of schemes so far approved.

Manufacture of spare parts.—As mentioned earlier some of the parts of the sewing machine are still imported. The productions of some of these items is however, expected to be taken up. A licence has been issued to M/s. Sewing Spares Private Ltd., New Delhi, for the manufacture of oscillating rock shaft, bobbon case, pressure foot, square roller, thread take up lever and shuttle. M/s. Jay Engineering Works Ltd., Calcutta, are also taking up the manufacture of these parts and it is envisaged that by the end of the Third Five Year Plan most of these parts would be available from indigenous source.

Development in the small-scale sector.—To produce 1·5 lakh sewing machines by the end of the Third Five Year Plan various measures for the development of small-scale units have already been taken during 1956-61 and it is proposed to pursue them vigorously in the quinquennium of the Third Plan. The problem of factory accommodation is proposed to be met through allotment of factory sheds in Industrial estates. The National Small Industries Corporation is considering stocking of necessary raw materials for small-scale units. The corporation is also considering certain measures for providing marketing facilities to the small units. Steps are also being taken by the Indian Standard Institution to lay down standard specifications for sewing machines and parts. These measures are expected to improve the quality of the products of small-scale units.

Investment and employment.—The total investment to cover the schemes under implementation is estimated to be about Rs. 1·5 crores to Rs. 2·0 crores during the period of the Third Plan. These schemes will create new employment for about 2,000 persons.

Requirements of raw materials.—The requirements of main raw materials for the production of 850,000 machines are estimated to be as follows:

Material	Quantity
Pig iron (tons)	28,300
Steel (other than free cutting type and M.S. Strips) (tons)	2,080
Steel free cutting and strips (tons)	4,930
Steel balls (gross)	95,715
Needles (Gross)	34,000

The following table summarises the development of the sewing machines industry envisaged during the period of the Third Plan:

(In numbers)

	1960-61	1965-66
Annual rated capacity (double shift basis)	267,400	700,000
Production	850,000**	347,300*
Internal requirements	322,000	700,000
Exports	25,950	150,000

*Includes 50,000 machines produced in the small scale sector.

**Includes 150,000 domestic sewing machines expected to be produced by the Small scale sector.

27. REFRIGERATORS AND OTHER COOLERS

Air Conditioning and refrigeration are two important requirements of a developing economy, while in certain industries, air conditioning and refrigeration are absolutely essential for process control, in many other fields these two facilities are environmental factors capable of raising productivity of workers and employees. In the agricultural field cold storage facilities are essential for preventing decay of perishable products *e.g.*, potatoes, fruits etc. Refrigerated van services on railways help to transport perishable foods undecayed to consumption centres. Refrigerators are essential for preservation of modern drugs and they are also an indicator of the higher standards of living.

1. Brief Survey of the Industry :

Targets.—No development programme for this industry was formulated in 1956 and no production target for 1960-61 were envisaged. Its development was regulated on an *ad hoc* basis over the last 10 years.

Capacity and production.—Manufacture of refrigerators and air-conditioners commenced only after 1951. The industry made a beginning by assembling imported components and parts. During the Second Plan period, new capacity for 6,000 numbers of domestic refrigerators and 670 numbers of room air-conditioners was created in the country. An idea of the current unit-wise break-up of the installed capacity and its product-wise distribution can be had from the data given below :

(Nos.)

Firm	Domestic refrigerators	Commercial refrigerators	Air-conditioners	Water coolers
1	2	3	4	5
Bombay—				
M/s. Voltas Ltd., Bombay	..	..	8,400	2,400
M/s. Blue Star Engineering Co., Bombay.	..	80	120	600
M/s. Air conditioing Corporation Ltd., Bombay.	..	..	..	300
M/s. Godrej Boyce Manufacturing Co., Bombay.	4,000	..	..	..
M/s. Dadjee Dhaleji, Bombay	..	..	720	..
Punjab—				
M/s. Electronic Ltd., Faridabad	..	..	1,500	..
Delhi—				
M/s. Fedders Lloyd, Delhi	..	..	1,000	..
West Bengal—				
M/s. American Refrigerator Co., Calcutta.	..	..	780	800
M/s. Refrigerators (India), Calcutta	..	292	300	..
M/s. Air-condition Corporation Ltd., Calcutta.	..	..	1,680	..
M/s. Premier Automobile Ltd., Calcutta.	..	..	3,600	..
M/s. Sur Industries, Calcutta	2,400	..	2,400	..

1	2	3	4	5
Andhra—				
M/s. Hyderabad Allwyn Metal Works, Hyderabad.	4,800	..	..	..
Orissa—				
M/s. Kalinga Industries, Cuttak .	2,400	..	..	..
TOTAL .	13,600	372	20,470	3,900

The production of these items since 1955 was as follows:—

(Nos.)

	Domestic Refrigerators	Commercial Refrigerators	Room Air-conditioners	Water coolers
1955	525	..	2,122	691
1956	750	..	5,824	967
1957	942	38	6,983	1,390
1958	2,901	43	10,908	2,146
1959	3,965	40	8,480	1,924
1960	11,400	55	10,740	2,183

Room air-conditioners are generally manufactured in cooling capacities of ¾ ton, 1 ton and 2 tons; the price of a 1 ton unit being about Rs. 2,500. Domestic refrigerators are manufactured in varying sizes of 6 to 8½ cu. ft. and commercial refrigerators above that. The price of a 7½ cu. ft. refrigerator is about Rs. 2,000. Water coolers generally of two types—instantaneous cooling type and type with storage facilities. The price of a 40 gallons per hour water cooler with storage facilities comes to about Rs. 2,000.

The indigenous content of the refrigerators and other coolers, at present manufactured in the country, is as follows :

Domestic Refrigerator	85%
Commercial Refrigerator	85%
Room Air-conditioner	78%
Water Cooler	78%

To guide the quality of the indigenous products the Indian Standard Institution has finalised the following specifications.

Indian Standard Specification No. 1391 for room air-conditioner.
Indian Standard Specification No. 1476 for domestic refrigerator.
Ind an Standard Specification No. 1474 for commercial refrigerator.
Indian Standard Specification No. 1475 for water cooler.

Imports and exports.—The imports of domestic and commercial refrigerators, air conditioning machinery and products including compressors are given below :

	(Rs. Lakhs)
1957	344
1958	216
1959	193
1960	217

The downward trend in import is mainly due to severe import restrictions. Manufacture of refrigerators is still an infant industry and, the products are relatively high priced. There were, therefore, no exports of domestic products so far. A trade delegation which visited some of the West Asian and West European countries reported that there is scope for exporting Indian made domestic refrigerators, room air-conditioners and water coolers to many countries, provided prices are reduced and appropriate sales promotion practices are adopted. The Engineering Export Promotion Council is actively examining the possibilities for export.

Development Council.—Refrigerators and other Coolers Industry comes within the purview of Development Council for light Electrical Industries.

II. Programme of Development in the Third Plan :

Estimated requirements.—Taking into consideration the factors of demand, past production trends and the situation in regard to imported raw materials, the following capacity and production targets for 1965-66, were recommended by the Development Council for Light Electrical Industries and accepted by the Government as the basis for formulating expansion programmes under the Third Plan.

	Nos.
Domestic Refrigerators	50,000
Commercial refrigerators (including ice-cream cabinet bottle coolers, display & walk-in type etc.)	6,000
Room air-conditioners	50,000
Water coolers	20,000

Schemes licensed and under implementation.—A number of schemes designed to increase the capacity of the industry has already been licensed under the Industries (Development and Regulations) Act. Details of the

schemes approved for implementation and expected to materialise during the Third Plan period are given below :

(Nos.)

Firm	Domestic refrigerators	Commercial refrigerators	Room air-conditioners	Water coolers
1	2	3	4	5
M/s. Godrej & Boyce Manufacturing Co., Bombay.	2,000	..	..	..
M/s. Electronic Ltd., New Delhi . .	6,000	..	..	..
M/s. Blue Star Engineering Co., Bombay .	..	220	380	600
M/s. American Refrigerator Co., Calcutta	..	1,200	2,550	..
M/s. Punj & Sons, New Delhi . .	10,000	..	..	..
M/s. Hyderabad Allwyn Metal Works, Hyderabad.	5,200	..	..	..
M/s. Refrigerators & Home Appliances Ltd., Madras.	..	360	..	600
M/s. Good House Co., Calcutta . .	6,000	..	..	..
M/s. Richardson Cruddas, Bombay .	..	..	..	180
M/s. Frick Co., New Delhi . . .	..	..	1,000	..
M/s. Carrier International Ltd., Bombay .	..	..	15,600	..
M/s. Air Conditioning Corp. Ltd., Calcutta.	..	..	480	..
TOTAL . .	29,200	1,780	20,010	1,380

Additional capacity.—With the implementation of the schemes enumerated above the annual rated capacity of the industry on single shift basis will be as follows :

	Nos.
Domestic refrigerators	42,800
Commercial refrigerators	2,152
Room air-conditioners	40,480
Water coolers	5,280

Reckoning production on double shifts basis it would be seen that the total capacity in view for domestic refrigerators & room air-conditioners would be more than adequate to meet the targets. In respect of the commercial refrigerators and water coolers, however, even on the same assumptions there is further scope for expansion *vis-a-vis* the demand estimated for 1965-66.

Steel requirements.—For refrigerators and other coolers steel, in the orm of black sheets and galvanised sheets is normally used; for water coolers light steel structurals are also required to a small extent. Requirements of steel for the production targets of 1965-66 are brought out in the following table :

	Steel required for 100 units	(tons) Steel required for 1965-66 production targets
Air-conditioners	4·5	2,250
Domestic refrigerators	8·4	4,200
Commercial refrigerators (average requirements)	9·0	540
Water coolers	10·2	2,040
TOTAL		9,030

Components.—Excepting compressors and control units like cut outs, thermostats, modulating motors, humidistats, oil failure switches etc., practically all other components are manufactured in the country. Licences for a few schemes for the manufacture of sealed units and compressors have been issued. It is expected that the indigenous content of air-conditioners, refrigerators and water coolers will reach/exceed 95% by 1965-66.

The following table summarises the development programmes of the refrigerators and other coolers industry envisaged during the period of the Third Plan :

	1960	1965-66
Domestic refrigerators (Nos.)—		
Installed capacity	13,600	50,000
Production	11,400	50,000
Commercial refrigerators (Nos.)—		
Installed capacity	372	6,000
Production	55	6,000
Room air-conditioners (Nos.)—		
Installed capacity	20,470	50,000
Production	10,740	50,000
Water coolers (Nos.)—		
Installed capacity	3,900	20,000
Production	2,183	20,000

28. COATED ABRASIVES AND GRINDING WHEELS

A. Coated Abrasives

1. Review of Progress in the Second Plan:

Targets.—At the commencement of the Second Plan the annual rated capacity of the coated abrasive industry was estimated at 150,000 reams. Taking into account the programmes for the expansion of the industry then under contemplation, it was visualised that the annual rated capacity of the industry could increase to 255,000 reams by 1960-61.

The demand for coated abrasives was estimated to reach a figure of 150,000 reams by the end of the Second Plan period and a production target of the same order was envisaged to meet it.

As against the targets indicated above, the capacity, production and consumption levels estimated to have been reached by the end of the Plan period in this industry are reviewed in the following paragraphs.

Capacity and production.—During the Second Plan period the annual capacity of the industry increased by 50,000 reams as a result of M/s. Hindustan Abrasives, Omalur, Madras, going into production with an annual capacity of 10,000 reams and M/s. Carborundam Universal Ltd. expanding their capacity from 30,000 reams to 70,000 reams per annum.

There were at the end of the Second Plan period five units manufacturing coated abrasives with a total annual capacity of 200,000 reams as under :

Name of the Unit	Location	Annual Capacity (Reams)
M/s. Carborandum Universal Ltd. . . .	Madras . .	70,000
M/s. Krishanlal Thirani & Co.	Calcutta . .	42,000
M/s. Natural Sand Paper Mill	Ghaziabad (U.P.) .	30,000
M/s. Strawboard Manufacturing Co. . . .	Saharanpur (U.P.) .	48,000
M/s. Hindustan Abrasives	Omalur (Madras) .	10,000
TOTAL .		200,000

In addition to the organised factories mentioned above, coated abrasives are also manufactured by small scale producers. Complete and reliable statistical data on capacity and production of these units are however not available.

Production of coated abrasives in the organised sector during the last six years has been as given below:

	Production (Reams)
1955-56	85,376
1956-57	97,428
1957-58	94,862
1958-59	103,096
1959-60	107,882
1960-61	144,534

With the exception of the year 1957-58, the production of coated abrasives has shown a steady increase during the Plan Period. In the year 1957-58, there was a temporary recession in the production of coated abrasives mainly due to fall in offtake by some of the consuming industries which were not in a position to work to their full capacities due to shortage of steel.

Except for polishing papers of fine grit, crocus paper and cloth resin bonded coated abrasives which are not produced, the country is self-sufficient in respect of almost all the other types of coated abrasives.

Imports and exports.—Imports of most of the types of coated abrasives are totally banned except for crocus paper and emery polishing paper. A quota of 20% is at present permitted for crocus paper and emery polishing paper. The total quantity and value of imported coated abrasives during the Second Plan period have been as under :

	Quantity (cwt)	Value Rs. lakhs
1956	..	..
1957	11,907	24·34
1958	7,047	11·64
1959	4,095	8·35
1960	1,281	8·10

The industry has developed an export market in countries like Pakistan, Burma, Aden and some Middle East countries. The total quantity and value of coated abrasives exported in the last few years are indicated below:

	Quantity (cwt)	Value (Rupees)
1957	433	103,000
1958	68	17,000
1959	324	53,529
1960	432	19,581

Consumption.—Based on indigenous production and imports it is estimated that the overall consumption of coated abrasives in 1960-61 was roughly of the order of 150,000 reams.

Investment.—A sum of about Rs. 10 lakhs is estimated to have been invested in the coated abrasive industry during the period of the Second Plan.

II. Programme of Development in the Third Plan:

Estimated requirements.—The present demand for coated abrasives is estimated at about 150,000 reams. With the expansion of the engineering industries the requirements of abrasives are expected to increase substantially during the Third Plan period. Assuming a progressive increase in demand at the rate of 20% per annum, it is estimated that the requirements of coated abrasive would be about 400,000 reams by 1965-66.

Schemes licensed and under implementation.—The following development schemes are under implementation :

(i) M/s. Krishanlal Thirani have been given a licence to expand their capacity for the manufacture of waterproof coated abrasives from 42,000 reams to 72,000 reams.

(ii) M/s. Carborandum Universal Ltd., have been given a licence to expand their existing capacity by additional 80,000 reams per annum.

(iii) M/s. Hindustan Abrasives Ltd., Omalur, who have already gone into production for the manufacture of coated abrasives are expected to step up their capacity from 10,000 to 60,000 reams.

With the implementation of the above schemes, the total capacity for coated abrasives is expected to be 360,000 reams per annum.

Targets of capacity and production.—In order to achieve a production target of 400,000 reams by 1965-66 it is considered that a capacity of about 500,000 reams should be created by that year.

As the installed capacity is expected to increase to about 360,000 reams when all the schemes under implementation are completed, it will be necessary to create further capacity to the extent of 140,000 reams. However, before licensing additional capacity account has to be taken of the scope for increased production in the small scale sector.

Investment and foreign exchange.—The expansion required to achieve the capacity target of 500,000 reams indicated above is estimated to involve an investment of Rs. 85-90 lakhs during the Third Plan period.

The foreign exchange component of this investment is placed at about Rs. 50 lakhs.

Requirements of raw materials.—The main raw materials required for the coated abrasive industry are abrasive grains, synthetic and natural emery grain. In addition kraft paper and backing cloth are required. The requirements of kraft paper at the end of the Third Plan are estimated to be Rs. 25 to Rs. 30 lakhs per annum. The requirements of other raw materials are comparatively minor.

At present the industry is dependent on imports of kraft paper and synthetic abrasive grains for its major part of the requirements. Although capacity exists for certain types of emery grains in the country, the manufacturers of coated abrasives prefer synthetic grains imported from abroad as the quality of indigenous emery grain is stated to be not quite satisfactory. Backing cloth is available indigenously. However, since indigenous

capacity already exist for some of these raw materials and there are prospects of additional capacity being established during the Third Plan period, it is expected that the entire requirement of coated abrasive industry for its raw material will be met from indigenous sources by the end of the Third Plan period.

The following table summarises the programme of development of the industry during the Third Plan period :

	1960-61 (Reams)	1965-66 (Reams)
Installed capacity	200,000	500,000
Production	144,534	400,000

B. Grinding Wheels

1. Review of Progress in the Second Plan :

Targets.—At the beginning of the Second Plan, the capacity of the grinding wheel industry was estimated at 1,520 tons per annum. The schemes under implementation in April 1956 were expected to increase the capacity to 2,110 tons per annum which was recommended as the capacity target for 1960-61.

The demand for grinding wheels was estimated to increase to 1,500 tons by the end of the Second Plan period and production of the same order was envisaged to meet it.

As against the targets indicated above, the actual progress made in this industry during the Second Plan period is set forth in the following paragraphs.

Capacity, production and consumption.—In April 1956, there were 4 units producing grinding wheels with an annual installed capacity of 1,520 tons. Since then two new units have gone into production and two of the existing units have expanded their capacity. Details of these are given below:

Name of the Unit	Nature of scheme	Location	New/Additional annual capacity (tons)
M/s Krishanlal Thirani & Co.	New Unit	Calcutta	240
M/s Thermal Products Co. Ltd.	Do.	Bombay	180
M/s Grindwell Abrasives Ltd.	Expansion	Do.	200
M/s. Carborandum Universal Ltd.	Do.	Madras	750
TOTAL			1,370

As a result of the implementation of the above schemes, the annual capacity for grinding wheels stood at 2,890 tons on 1-4-1961.

The state-wise distribution of the industry as on 1-4-1956 and on 1-4-1961 was as follows:

State	Position as on 1-4-56		Position as on 1-4-61	
	No. of units	Annual Capacity (tons)	No. of Units	Annual Capacity (tons)
Bombay	2	1,120	3	1,500
Calcutta	..	..	1	240
Madras	1	250	1	1,000
Delhi	1	150	1	150
TOTAL	4	1,520	6	2,890

The production of grinding wheels in the year 1955-56 and during the Second Plan period has been as given under:

	Production (tons)
1955-56	778
1956-57	1,258
1957-58	1,348
1958-59	1,145
1959-60	1,405
1960-61	2,042

It may be observed that with the exception of the year 1958-59, production of grinding wheels has shown a steady increase. The fall in production in 1958-59 is attributed to shortage of steel experienced by all the engineering industries leading to a decrease in the demand for grinding wheels.

Except for certain special varieties of grinding wheels such as rubber bonded grinding wheels for which imports are being permitted, nearly all the popular types of grinding wheels are now manufactured in the country.

The estimated consumption of grinding wheels on the basis of production plus imports (exports of grinding wheels have been insignificant) during the Second Plan period has been as given below :

(Figures in tons)

	Production	Imports*	Consumption
1956-57	1,258	282	1,540
1957-58	1,348	616	1,964
1958-59	1,145	165	1,310
1959-60	1,405	270	1,675
1960-61	2,042	142	2,184

*Figures are for calendar year.

Investment.—A sum of about Rs. 30 lakhs is estimated to have been invested in the grinding wheels industry during the Second Plan period.

Quality.—The quality of indigenous grinding wheels on the whole is reported to be satisfactory and is considered to be equal in quality to the imported product. With the introduction of the after-sales service by the major producers it is expected that even occasional complaints will be reduced to the minimum.

Major developments in the industry.—Protection to the grinding wheels industry has been withdrawn by the Government with effect from 1st January, 1960, in accordance with the main recommendation of the Tariff Commission which submitted its report on continuance of protection to this industry in July 1959.

Estimated requirements.—The consumption of grinding wheels in 1960-61 is estimated at about 2,180 tons. With the increase in industrial activity and greater availability of steel during the Third Plan period, the demand for grinding wheels is expected to increase substantially by the end of the Third Plan period. Assuming that the demand for grinding wheels will increase progressively at the rate of about 20% per annum during the Third Plan period, it is estimated that the requirements of grinding wheels will be of the order of 5,400 tons in 1965-66.

Schemes licensed and under implementation.—Licences under the Industries Act have been given for the expansion of the industry for the following schemes :—

(i) M/s. Grindwell Abrasives Ltd., Bombay, have been given a licence for expansion of their capacity from 1,200 tons to 1,800 tons per annum.

(ii) M/s. Carborandum Universal Ltd., Madras, have been licensed for expanding their capacity from 1,000 tons to 1,800 tons per annum.

(iii) M/s. Industrial Abrasives Cooperative Society have been recommended a licence to set up a factory at Mora Uran in Maharashtra with an annual capacity of 243 tons of grinding wheels, grinding bricks etc.

(iv) M/s. Krishanlal Thirani & Co., Calcutta, have been licensed for expanding their capacity from 240 tons to 500 tons per annum.

Arrangements for the import of plant and equipment for all these schemes are however yet to be made.

With the implementation of the above schemes the capacity of the industry will increase to about 4,760 tons per annum.

Targets of capacity and production.—Since it is desirable to achieve self sufficiency in grinding wheels, the demand for which is estimated at 5,400 tons in 1965-66 production of this order within the country by the

end of the Third Plan period is envisaged. It is considered that a capacity of the order of 6,500 tons will require to be established to achieve a production of 5,400 tons by 1965-66.

Additional capacity.—The installed capacity of the industry is expected to increase to about 4,760 tons, when all the schemes already licensed have been completed and so a further increase of about 1,740 tons will be necessary to achieve the target capacity of 6,500 tons.

Investment and foreign exchange.—It is estimated that a sum of about Rs. 1·5 crores would have to be invested in the grinding wheel industry during the Third Plan period. The foreign exchange component of this investment is placed at about Rs. 75 lakhs.

Requirements of raw materials.—The main raw materials required for grinding wheels are (1) synthetic abrasive grains and (ii) bonding materials. For a production target of 5,400 tons, the requirements of synthetic grains will be of the order of 6,500 tons to 7,000 tons and that of bonding materials between 800 to 1,000 tons.

Though some capacity for the manufacture of synthetic abrasive grains exists in the country, the major part of the requirements of this raw material is at present being met by imports. Steps will, therefore, have to be taken to establish more capacity for the manufacture of synthetic abrasive grains within the country. One of the reasons that deters entrepreneurs from establishing capacity for synthetic abrasive grains is the high cost of power which is required in substantial quantity. However certain proposals for the manufacture of synthetic abrasive grains are at present under consideration. It is expected that the entire requirements of this raw material for the grinding wheel industry will be met from indigenous source by the end of the Third Plan period.

The following table summarises the development of the grinding wheel industry envisaged during the period of the Third Plan :—

	1960-61	1965-66
Annual Capacity (tons)	2,890	6,500
Production (tons)	2,042	5,400

29. CLOCKS AND WATCHES

1. Review of progress in the Second Plan :

Clocks, timepieces and watches are the time recording instruments required in the country for normal use. Uptil 1959, only clocks were produced in the country. Demand for watches and timepieces was met by imports. The import statistics indicate that there was a record level of expenditure of foreign exchange amounting to Rs. 400 lakhs in 1956 for the procurement of clocks, watches and timepieces. Even in 1957, the import bill for these items was of the order of Rs. 240 lakhs. The question of conserving foreign exchange came to the forefront in 1957 and the impact of the efforts at saving on imports fell heavily on clocks, timepieces and watches which were totally banned for import for some time. It is under these circumstances that the need for indigenous production of these items was keenly felt. The Government of India constituted a Panel in January 1959 for clocks, timepieces and watches to advise on the development of this industry in the country. Further, schemes of private entrepreneurs were approved for implementation and some of these involved collaboration with well-known firms abroad.

Capacity and production

Clocks.—The following five units were engaged in the manufacture of clocks with an annual installed capacity of 66,000 pieces on a single shift basis and there was no foreign collaboration or foreign participation in this field :

Name of the firm	Annual Installed Capacity (Nos.)
M/s Dutex Clock Co., Calcutta	12,000
M/s. Hindustan Equipment Suppliers, Bombay	18,000
M/s. Scientific Clock & Co., Morvi	12,000
M/s. Swadeshi Electric Clock Co., Bombay.	12,000
M/s. Master Clock & Watch Co., Bombay	12,000
TOTAL	66,000

The production of clocks has risen in the past five years. It stood at 21,011 Nos. in 1956 and rose to 52,330 Nos. in 1960 representing a 150% increase, as shown below :

	Production of clocks (Nos.)
1956	21,011
1957	22,072
1958	30,505
1959	31,465
1960	52,330

Timepieces.—Nine schemes were approved for the manufacture of timepieces during the last year of the Second Plan with a total annual capacity of 872,000 Nos. One of these schemes has been planned in the public sector at the Government Precision Instrument Factory, Lucknow, with an annual capacity of 12,000 Nos. M/s. Jayana Time Industries, Delhi, which were one of the approved schemes for the manufacture of 60,000 timepieces per annum on a single shift basis, went into production in March 1961. In the case of other units, the progress has not been appreciable.

Watches.—Three schemes were sanctioned for the manufacture of watches with a combined annual capacity of 970,000 pieces on a single shift basis. Two of these schemes are in the private sector; the third unit is proposed to be developed in the public sector by the Hindustan Machine Tool Factory at Bangalore in collaboration with M/s. Citizen Watch Company of Japan and with an annual capacity of 360,000 pieces. In all these cases negotiations with foreign firms have been completed and phasing of production programmes worked out. All these projects were under implementation at the end of the Second Plan.

Imports

As already pointed out in 1956, when there was no restriction, the value of imports was about Rs. 400 lakhs. It came down in later years as a result of the restrictions enforced on imports. The following table shows the year-wise imports of clocks, timepieces and watches during the Second Plan period:

	Clocks & Timepieces		Watches		Watch movements	Clock movements
	'000 Nos.	Value (Rs. lakhs)	'000 Nos.	Value (Rs. lakhs)	(Value Rs. lakhs)	
1956 (April to December).	818	65·16	853	234·93	..	..
1957 . . .	468	46·42	837	232·87	0·57	2·85
1958 . . .	57	4·28	94	24·14	0·24	1·52
1959 . . .	268	23·64	6	2·01	5·90	1·47
1960 . . .	117	7·59	26	9·93	4·58	1·93

Watches were imported from Switzerland, West Germany and France. Watch movements were imported from Japan and Switzerland. Clocks and clock movements etc., were imported from U.K., Japan, Switzerland and West Germany.

II. Programme of Development in the Third Plan:

Estimated requirements.—A correct assessment of the demand for clocks, timepieces and watches is difficult as in the case of other similar durable consumer goods. Clocks are required for factories, commercial enterprises and other Government organisations and also for educational

institutions. Timepieces are largely required by students in hostels and dayscholars in their homes, small commercial shops and by office goers. Watches are used on an ever increasing scale.

The Panel set up in 1959 made a broad assessment of the present and future requirements as follows :

	Estimate of Effective Demand	
	Present requirements (Nos.)	Requirements by 1965-66
Clocks	100,000	200,000
Timepieces	600,000	1,200,000
Watches	1,000,000	1,200,000

(a) *Developments in the Large-scale Sector*

Watches.—The following schemes were approved and are expected to come into production during the next few years.

Public sector project—Watch Factory of the Hindustan Machine Tools Ltd.—The scheme for manufacture of watches was finalised in 1960 as a subsidiary unit of the H.M.T. in collaboration with M/s. Citizen Watch Co., Japan. Under the scheme in its final shape it is proposed to have the following 6-year programme starting with an annual output of 55,500 pieces in the first year :

	No. of watches to be produced each year	Proportion of indigenous component by value
First year	55,500	54%
Second year	195,000	60%
Third year	240,000	72%
Fourth year	240,000	84%
Fifth year	240,000	84%
Sixth year	360,000	84%

Half the number of watches produced will be for gents and the other half for ladies and these will be of the latest full-lever type. The scheme is estimated to cost Rs. 250 lakhs. The factory has started in August 1961 the assembly of watches from imported components and would soon produce the components as well in accordance with the approved manufacturing programmes.

Private sector schemes.—The scheme of M/s. Indo-French Time Industries Private Ltd., Bombay, was approved in June 1959 with the collaboration of M/s. SEDIM of France. The factory will be established with an

annual capacity of 310,000 pieces on a single shift basis with the following phased programme :

('000 Nos.)

	Pin Lever type (Gents)	Full Lever type (Ladies & (gents)	Total
First year	50	40	90
Second year	60	100	160
Third year	60	120	180
Fourth year	60	200	260
Fifth year	60	250	310

The scheme of M/s. Asika Industries Ltd., Bombay, was sanctioned during 1960 for the manufacture of wrist watches with an annual capacity of 3 lakh Nos. on a single shift basis in collaboration with M/s. Kasper and Co., West Germany. The development programme has been phased as follows :

('000 Nos.)

	Annual Capacity
1st year	90
2nd year	240
3rd year	240
4th year	300
5th year	300

The scheme of M/s. Hindustan Equipment Suppliers, Ltd., Bombay has been sanctioned in 1961 for the establishment of a watch factory with an annual capacity on a single shift basis of 300,000 Nos. in collaboration with M/s. L. I. P. Besancon, France. The programme of manufacture has been phased as follows :

('000 Nos.)

	Annual Capacity
First year	82
Second year	130
Third year and onwards	300

Timepieces.—The following schemes for the manufacture of timepieces are currently under implementation.

('000 Nos.)

Name	Annual Capacity on single shift basis	Foreign Collaboration	Location
(*a*) Public Sector.—			
Government Precision Instruments Factory, Lucknow.	12	..	Lucknow.
(*b*) Private Sector.—			
M/s. Dutex Clocks Co., Calcutta .	120	..	Calcutta.
M/s Hindustan Equipment Suppliers, Bombay.	150	Kovo, Praha, Czechoslovakia.	Bombay.
M/s. Scientific Clock Manufacturing Co., Morvi.	150	..	Morvi.
M/s. Union Watch Co., Delhi . .	100	..	Delhi.
M/s. Diamond Clock Co., Poona .	60	..	Poona.
M/s. Sifco Ltd., C/o. C.C. Desai, New Delhi.	120	Zag, S. A. of Pari & M/s. Velick Holding S. A. of Geneva.	Hyderabad.
M/s Time Industries, C/o. Royal Watch Co., Ahmedabad.	100	Collaboration from Japan is under consideration.	Ahmedabad.

In all these schemes, import of components is generally to be allowed for first three years at a rate not exceeding Rs. 3 per timepicce. At the end of three years, import of only springs would be considered if the same are not produced in the country by then.

Clocks.—M/s. Diamond Clock Co., Poona, have been approved in the private sector to manufacture, alongwith timepieces, 12,000 lever clocks and 12,000 electric clocks. Another scheme of M/s. Scientific Clock Co., Morvi has been approved for the manufacture of 5,000 transistor clocks. The capacity of M/s. Master Clock & Watch Co. is being raised to 30,000 Nos. of clocks per annum.

Targets for capacity and production.—The Third Plan targets are based on the above estimates of requirements made by the Panel.

Raw materials.—The principal raw materials for clocks, timepieces and watches are brass strips and brass rods, stainless steel, brushed aluminium, special steel strips and rods. Other miscellaneous items are clock oil, wires, rods from 4 SWG to 20 SWG, outside glass, outside plates, dials and hands etc.

Investment.—A provision of Rs. 4 crores including Rs. 2·5 crores as foreign exchange component has been made for investment on clocks and watches industry during the Third Plan period.

(b) *Development in the Small-scale Sector*

The manufacture of clocks, timepieces and watches in the small-scale sector has been gaining importance for the last few years. Beginning was made by starting 25 units for the manufacture of clocks in various States. The installed capacity and production of these units during 1960 were 18,000 Nos. and 1850 Nos. respectively. Six schemes have been approved for the first time in small-scale sector to take up the manufacture of watches with an installed capacity of 72,000 Nos. per year. The location and capacities approved are as follows :

Name of the Firm	Capacity approved per annum (Nos.)
M/s. Allina Industries, Ludhiana	12,000
M/s. Grinar Industires, Ludhiana	12,000
M/s. Jabee Industries, Ludhiana	12,000
M/s. Kuldip Industries, Chandigarh	12,000
M/s. Bhartiya Industries, Himcchal Pradesh	12,000
M/s. Naveen Bhartiya Industries, Delhi	12,000

The suitable type of watch recommended by the Panel for manufacture in the small-scale sector is $10\frac{1}{2}$ and $11\frac{1}{2}$ ligne, centre second, gents full lever jewelled watch.

The small-scale sector has also come forward to launch the manufacture of timepieces and twelve schemes have been approved. Their location and capacities are as follows :

Name of the Firm	Capacity per year (Nos.)	Foreign Collaboration
M/s. Sun Dial Watch Co., Calcutta	60,000	M/s. Kienzle Uhren A.C., Germany.
M/s. Time Aid: Clock Industry, Bombay	96,000	M/s. L. D. Seymeur and Co., U.S.A.
M/s. Paren Clock Industry, Bombay	18,000	..
M/s. Indo Swiss Watch Co., Chandigarh	N.A.	
M/s. Bharat Stores, Chandigarh	,,	
M/s. Ellora Watch Co., Gurgaon	,,	
M/s. A. K. Precision Mfg. Co., Pathankot	,,	
M/s. Globe Industries & General Mechanicals, Panipat.	,,	
M/s. Indian National Industries, Moga	,,	
M/s. Janapath Industries Ltd., Mysore	,,	
M/s. Bal Bandhoo Best-Karanj, Akola	,,	
M/s. Sonioho, Ludhiana	,,	

Before further capacity is created in the large or the small-scale sector, for these items, it is intended to watch the working of schemes approved for implementation for about three years because entirely new ground is being broken in a field where quality and cost are of crucial importance.

30. MEDICAL APPLIANCES—SURGICAL INSTRUMENTS AND X-RAY EQUIPMENT

The proper functioning of the health services depends not only on the availability of drugs but also on the availability of modern medical instruments, appliances and equipment. It is, therefore, important to develop not only the pharmaceutical industry but also the other branches producing medical instruments and appliances, photographic films for X-ray work and items like glass syringes and thermometers.

In the following sections the development of production facilities for some important medical appliances, *e.g.*, surgical instruments and X-ray equipment under the Third Plan has been outlined. Some of the other items are dealt under relevant industries, *e.g.*, X-ray films under 'Photographic Films and Papers'; Nitrous oxide under "Industrial Gases".

A. Medical Application and Surgical Instruments

1. Brief Survey of the Industry:

As in the case of essential drugs and pharmaceuticals, the country has been dependent on imports of all important items of medical appliances and surgical instruments. Simple types of medical appliances such as dental chairs, sterilisers etc. are, however, manufactured in the country mainly in the small-scale sector.

With the expansion of the health facilities in the country and increasing demand for medical appliances and surgical instruments, the need for undertaking their production in the country came to be recognised. In their recommendations the U.S.S.R. expert team which visited this country in 1956 proposed *inter alia* the setting up of a factory in the public sector for the manufacture of surgical instruments with a view to achieving self-sufficiency in the more important items.

Capacity and production.—There are at present 7 units in the organised sector for the manufacture of medical appliances. One of the units has recently discontinued production. The names of these units and the items produced by them are indicated below:

Name of the Unit	Location	Items manufactured	Annual Capacity
1	2	3	4
M/s. National Steel Equipment Co.	Bombay	1. Sterilisers 2. Suction apparatus 3. Premature Baby's incubators	Rs. 9,0 lakhs
M/s. National Surgical Instrument Co.	Bombay	1. Auto Claves 2. Suction Pumps 3. Sterilizers	..

1	2	3	4
		4. Dressing drums.	
		5. Miscellaneous.	
M/s. Imperial Surgico Industries	Lucknow	1. High pressure steam sterilizers.	
		2. Sobiumulbusch sterilizers . . .	150 Numbers.
		3. High pressure steam sterilizer electric.	
M/s. Mukerjee & Banerjee Surgical Private Ltd. . . .	Calcutta	1. Dressing drums.	
		2. Sterlizers.	
		3. Suction apparatus.	
		4. Operation tables .	Rs. 3·25 lakhs
		5. Dissection forceps & other misc. items.	
M/s. Indian Oxygen Ltd. .	Calcutta	1. Major anesthetic and analgetic apparatus.	700 Nos.
		2. Oxygen therapy. .	5,750 Nos.
		3. Medical pipeline accessories . . .	200 Nos.
M/s. Hindustan Syringes (P) Ltd.	Faridabad (Punjab)	All glass syringes (from 2 c.c. to 20 c.c.).	50,000 dozens.
*M/s. Guest Keen Williams Ltd.	Calcutta .	Hypodermic needles .	11,700 gross

*The firm has recently discontinued production.

The capacity of these units is reckoned in different units such as numbers, value of product etc. and is not strictly comparable.

The actual production of these units in the organised sector in the last two years of the Second Plan is estimated to have been as follows:

	Rs. lakhs
1959	12·47
1960	14·72

In addition, there are a number of units operating in the small-scale sector. Adequate data on the capacity and production of these units are, however, not available.

Imports.—Imports of medical appliances and surgical instruments in the last few years have been as follows:

	Imports of surgical, medical and dental instruments and appliances (Rs. lakhs)
1957	62·58
1958	54·93
1959	60·85
1960	66·88

Consumption.—On the basis of production in the organized sector plus imports, the current level of cosumption of medical appliances and surgical instruments is estimated to be of the order of Rs. 82 lakhs. Due to import restrictions and inadequate supply of raw materials to the manufacturing units, as well as the non-availability of data on supplies from the small scale sector it is difficult to make a reasonably accurate forecast of current demand and off take.

II. Programme of Development in the Third Plan:

Estimated requirements.—Though it is rather difficult to indicate requirements of different types of medical appliances and surgical instruments by the end of the Third Plan period, these are expected to grow very considerably by 1965-66 with the expansion of the medical facilities. It has been proposed that these requirements should be planned to be met almost fully from indigenous sources by expansion of capacity in the public and private sectors.

Schemes licensed and under implementation.—The following units have been licensed for the manufacture of various items of medical appliances.

Name of the Unit	Location	Items to be manufactured	Annual Capacity
M/s. M. Shah & Co.	Bombay	1. Stethoscopes	24,000 Nos.
		2. Hypodermic needles	12,000 gross.
		3. Manometers	6,000 Nos.
M/s. Phillips India Ltd.	Calcutta	Portable sterilisers of various types	975 pieces.
M/s. Kangan Pvt. Ltd.	Bombay	Hypodermic syringes	1·5 lakhs.
M/s. Sacha Internationals	Madras	Hypodermic syringes	1·5 lakhs.
M/s. Pearls & Beads India	Aligarh (U.P.)	All glass syringes	—
M/s. Hi-Tech Precision Glass	Dholpur (Rajasthan)	Glass tubing and syringes etc.	—

The major contribution in this field, however, will be made by the Surgical Instrument Plant in the public sector proposed to be set up at Guindy, near Madras. This unit will have a capacity of 2·5 million pieces of various types of principal surgical instruments which are used in the general surgery, ophthalmalogy, stomatology, gynaecology and in other branches of medicine, covering 25 groups. The production capacity in each group is indicated in the Annexure at the end.

The total value of the output, when the plant achieves full production, is estimated at Rs. 2·8 crores. The project is being set up with assistance from the U.S.S.R. Government. The detailed project report has been received and is at present under scrutiny. It is expected that the project will go into production during the Third Plan period. The project is estimated to cost about Rs. 2·7 crores and will give employment to about 2,000 persons.

Requirements of raw materials.—The main raw materials required for this industry are stainless steel, tool steel and carbon steel, forgings and stampings, steel and iron castings, special types of glass and small quantities of non-ferrous metals like brass, lead, silver etc. Most of these raw materials are expected to be available from within the country in due course. At present, the special steel and alloy tools steels are imported but with the development of the alloy tools steels and stainless steel production in the country supplies are expected to become available from indigenous sources before the end of the Third Plan.

B. X-Ray Equipment

1. Brief Survey of the Industry:

Rated capacity, production and imports.—The manufacture of X-ray equipment has not so far been undertaken on any organised large scale in the country even though one firm has been producing some types of X-ray equipment on small scale. Quite recently however, full scale production of simple types of X-ray equipment has started with some of the licensed units going into production. The present production of X-ray equipment including some mechanical and other items, mainly for replacement purposes, is estimated to be only about Rs. 10 lakhs per annum. The country's requirements for X-ray equipments are therefore being met almost entirely by imports. The value of imports of X-ray equipment including parts during the last few years was as follows:

	Value of Imports* (Rs. lakhs)
1955-56	51·27
1956-57	60·00 (estimated)
1957-58	56·70
1958-59	38·22
1959-60	50·37
1960-61	46·73

*Imports from 1957-58 onwards are for calendar years.

Having regard to expansion of medical facilities in the Second and subsequent Plans and the increasing requirements of X-ray equipment, the Government of India constituted a Panel in 1956 for the development and manufacture of X-ray equipment in India. The Panel recommended that Government should give permission to two or three firms to undertake the manufacture of all the ranges and types of X-ray equipment and other accessories. The Panel estimated that the number of different categories of X-ray equipment required during the five year period (roughly corresponding to the Second Plan period) would be 1,225.

Taking into account the restrictions imposed on imports and also the establishment of increased medical facilities it has been estimated that the present annual demand would be of the order of Rs. 100 lakhs. This would indicate that the present availability of X-ray equipment is short of the effective demand and that if imports were allowed more freely, the offtake could be near about the estimated demand.

II. Programme of Development in the Third Plan:

Estimated requirements.—With the rapid industralisation of the country and with increased medical facilities being planned, it is estimated that the demand for X-ray and electro-medical equipment would expand in terms of value to about twice the present level, by the end of the Third Plan period. The establishment of heavy industries such as steel projects, foundry forge etc. would also lead to an increase in the demand for industrial types of radiation equipment. Taking all these factors into consideration, it has been estimated that the demand for X-ray and electro-medical equipment will be of the order of Rs. 200 lakhs per annum up to the end of the Third Plan period.

Schemes licensed and under implementation.—The following schemes have been licensed under the Industries Act for the manufacture of X-ray equipment:—

Name of the Firm	Location of the factory
M/s. Radon House, Calcutta	Calcutta.
M/s. Siemens Engineering Co.	Bombay.
M/s. Escorts Ltd., New Delhi	New Delhi.
M/s. International General Electric Co., Calcutta	Poona.
M/s. Phillips India Ltd.	Calcutta.
M/s. Electro-medical and Allied Industries Private Ltd.	Calcutta.

Each of these units is licensed for a capacity of Rs. 30 lakhs worth of X-ray equipment per annum. Except for the scheme of M/s. Radon House, all the other above schemes involve foreign collaboration. The range of equipment that would be produced is expected to cover the majority types of

equipments required by hospitals and medical practitioners. The production of certain types of specialised equipments which are required in small numbers will be developed later.

M/s. Randon House, Calcutta are already producing X-ray equipment on small-scale. M/s. Siemens Engineering Company, Bombay have made a start with the manufacture of simple types of X-ray equipment. M/s. Escorts Ltd., New Delhi are expected to go into production shortly. The other firms are finalising their plans for the import of plant and machinery.

Additional capacity.—With the implementation of the above schemes the annual capacity of the industry is expected to be about Rs. 180 lakhs worth of X-ray and electro-medical equipment. From this it would seem that almost all the estimated requirements for X-ray and electro-medical equipment by the end of the Third Plan period would be met except for some specialised and high powered equipments the demand for which is expected to be comparatively small.

Investment.—A sum of about Rs. 1 to 1·25 crores is expected to be invested in the X-ray and electro-medical equipment industry during the Third Plan Period.

The following table summarises the development programme of the medical appliances, surgical instruments and X-ray equipment industry during the period of the Third Plan.

	1960-61 Production (Rs. lakhs)	1965-66 Production (Rs. lakhs)
Medical applicances and surgical instruments (organised sector only)	14·72	300·0
X-ray equipment	10·0	200·0

ANNEXURE

Various types of Surgical Instruments proposed to be manufactured at the Surgical Instrument Plant, Guindy

Instruments	Quantity
Different types of surgical knives and scalpels	200,000 pieces.
Scalpels with removal blades	100,000 sets.
Forceps	500,000 pieces.
Bone cutting forceps and others	100,000 ,,
Surgical Scissors	700,000 ,,
Needle holders	40,000 ,,
Clamps	500,000 ,,
Speculums & wound retractor	20,000 ,,
Surgical hooks	25,000 ,,
Different types of curettes and bone scoops	50,000 ,,
Raspatory for detaching the periosteum from the bone	10,000 ,,
Gauges	9,000 ,,
Surgical saws	10,000 ,,
Wire saws and guides for them	15,000 sets.
Spatulas	20,000 pieces.
Probes	30,000 ,,
Gynecological forceps	15,000 ,,
Pelvimeters	5,000 ,,
Rectal speculums	3,000 ,,
Braces, reamers & drills	2,000 ,,
Dental instruments, teeth filling instruments	50,000 ,,
Dental forceps	20,000 ,,
Tracheal tubes	25,000 ,,
Smith Petersen Trifid Nails	1,000 ,,
Ligature needles	5,000 ,,
TOTAL	2,500,000 pieces.

ELECTRICAL ENGINEERING INDUSTRIES

31. HEAVY ELECTRICAL EQUIPMENT

Brief Review of the Industry:

Heavy electrical equipment generally include all the heavier and more complicated machinery such as hydraulic turbines, steam turbines, alternators, other rotating electrical equipment such as traction motors, industrial motors, D. C. generators and motors, synchronous condensers, power transformers of 3,000 KVA and above, capacitors, rectifiers and all types of HT-switchgears. All these types of equipment are needed mostly by the power supply authorities, railways and large industrial undertakings.

The demand for the heavy electrical equipment is directly related to growth of demand for power. Availability of adequate power in various parts of the country is an essential pre-requisite to a large programme of industrialisation and economic betterment.

The Third Plan provides for increasing the power capacity from 5·7 to about 12·7 million KW, an addition of 7 million KW in five years. Development of power in the Fourth and subsequent plan periods (*i.e.* beyond 1966) would be on a much larger scale. There is no dearth of fuel or water resources in our country to retard the growth of power development on the scale visualised for 1966-71 and the years beyond. India has also recently entered the field of nuclear power generation. With the different characteristics of the above three modes of power generation with their respective restrictions on locations, capital and running costs, an economic optimum will be obtained by interconnected operation of these stations with the help of progressively expanding grid systems.

Programmes for power development as foreseen above would call for a large quantum and variety of electrical machinery for installation both at the generating stations and at the various substations of the regional and State girds. Electricity generation and transmission is highly capital intensive and a substantial portion of the outlay—nearly 25 per cent on hydro stations, over 50 per cent on steam stations and about 30 per cent on transmission—constitutes the expenditure on machinery. India has so far depended on imports for almost every item of heavy electrical machinery on the generation side though some progress has no doubt been made on indigenous manufacture of distribution equipment.

The importance of organising indigenous production of heavy electrical equipment was recognised in the First Five Year Plan and decision taken to make the necessary financial provision for it under the plan period from out of the lump-sum allocation for industries, minerals and transport. As a preliminary step, the Gadkary Committee was entrusted in 1953 with the task of making a forecast of future requirements which would provide the background for the formulation of the scope and content of the factory to be established. The Committee submitted its report in January, 1955. Thereafter

Government invited proposals from well-known firms engaged in this field (M/s. A.E.I. of U.K., M/s. Siemens of Germany, M/s. Westinghouse of U.S.A.) for technical and financial collaboration with the Government of India. After a scrutiny of the offers received, Government selected M/s. A.E.I. of U.K. as Consultants for the Project in November, 1955. Thereafter M/s. A.E.I. prepared a detailed Project Report for this major public sector project, and examined several sites in the country which were *prima facie* suitable for the location of the plant. In early 1957, the Government accepted the Project Report of M/s. A.E.I. and decided upon a site adjoining Bhopal in Madhya Pradesh for the location of the heavy electrical plant. Preparatory work was begun on the construction of the factory and the Government Company, Heavy Electricals Ltd. was entrusted with the responsibility for its execution. The salient features of the Bhopal project are as follows:

Fixed Capital investment	Rs. 35·25 crores.
Foreign Exchange expenditure on capital account	Rs. 17·50 crores.
Period of completion of the construction phase	4 years.
Full turnover and the target year for its achievement	Rs. 12·5 corores in the 13th year.
Personnel required	8,487

Early recognition was given to the training programme aspect of the project and arrangements were made in 1957 for starting a training school.

The progress on the project received a setback as a result of the foreign exchange crisis of 1957. Government took the decision to split its development into three phases instead of going ahead simultaneously with the installation of production facilities for all the items. The phasing was visualised as follows :—

Phase I.—Stationary Equipment; Transformers, Switchgears, Controlgears & Capacitors

Phase II.—Rotating Equipment; Traction Motors and Industrial Motors.

Phase III.—Turbines & Rectifiers

The implementation of the project progressed on the revised basis during the rest of the Second Plan period. In 1959, the position was reviewed in the context of the rates of power development likely to be thought of under the Third Plan and the following years and decisions were taken that the project should be executed as on integrated basis; its output should be doubled and later on raised to the level of Rs. 50 crores by multiple shift operation and installation of additional plant equipment mainly of balancing nature.

By the end of the Second Plan, the Heavy Electricals Ltd., Bhopal recorded progress as shown below:

Total fixed capital investment	Rs. 24·42 crores.
Foreign exchange expenditure	Rs. 4·36 crores.
No. of apprentices turned out at the training school	3,000.
No. of houses built	2,500.

The transformer and switchgear shop was ready to go into production and orders for manufacture were booked from some of the State Governments.

II. Programme of Development in the Third Plan:

Estimated Requirements.—From the studies made towards the end of the Second Plan by the Machinery Working Group, it became evident that the demand for heavy electrical machinery in the Third and subsequent plans would be quite substantial. The Central Water & Power Commission had placed the demand as below on the assumption that two million KW of generating capacity would be added annually during the Fourth Five Year Plan:

Steam and hydraulic turbines and generators	2 million KW.
Transformers 33 KV & above	6 million KVA.
Heavy industrial motors	0·5 million H.P.
Traction motors	0·2 million H.P.
Control gears for industrial motors & traction motors	Rs. 5 crores.
High tension switchgears	Rs. 6·27 crores.
Static capacitors	30,000 KVA.
Rectifiers	81,000 KW.
Switch-boards & controls with instruments	Rs. 5 crores.

The total value of the requirements was assessed at Rs. 80·65 crores annually.

It was decided as a result of this demand projection, to augment the manufacturing capacity in the country by developing the Bhopal factory to its optimum limit and to construct two new plants—one with U.S.S.R. collaboration and the other with the assistance of Czechoslovakia. The project to be developed with Czech assistance covered an additional unit for the manufacture of high pressure boilers for thermal stations. Preliminary studies on these new projects were commenced in the last year of the Second Plan. The production programme as provisionally finalised for the three heavy electrical projects is given below:

Heavy Electricals Ltd., Bhopal—Ultimate stage production programme

(Rs. 50 crores output)

Items	Range of sizes	Approximate output
1	2	3
Hydraulic turbines and generators	Upto 150,000 KW	500,000 KW per annum.
Steam turbines-generators and condensing plant.	Upto 150,000 KW	500,000 KW per annum.
Generators for diesel sets	100 to 2,000 KW	as required.

1	2	3
Transformers	10,000 KVA and above at 33 KV and above.	6,000,000 KVA per annum.
Current & potential transformers	..	as required.
Static capacitors	..	as required.
A. C. circuit breakers	11 to 275 KV	4,100 units per annum.
D. C. circuit breakers	..	as required.
Switchboards and control desks	..	as required.
D. C. motors, generators and exciters	Max. size 5,000 H.P.	65,500 KW per annum.
Welding generators (D.C.)		as required.
Traction electrical equipment including motors, controlgears, transformers and rectifiers.		For 60 Elect. Locomotives, 50 Diesel Electric Locomotives and 50 E.M. units per annum.
A. C. industrial motors	Ratings 500 to 5,500 H.P.	250,000 HP per annum.
Industrial motor control gears	..	to match motors made in the factory.

The increase in the production from Rs. 25·0 crores is estimated to involve an addditional outlay of Rs. 27·8 crores. The project will be developed in such a manner that the expansion programme is dovetailed into the present phase of development. The production build-up during the Third Plan and the subsequent years is visualised as under:

	Production build-up output (Rs. crores)
1961-62	2·9
1962-63	9·0
1963-64	14·6
1964-65	27·2
1965-66	32·8
1966-67	38·8
1967-68	44·0
1968-69	48·3
1969-70	52·5

As there would be a larger uncovered gap even after the expansion of the Bhopal plant, it was proposed as already mentioned, to set up two new Heavy Electrical Plants one under the 1,500 million rouble credit and the other under the Czech credit for the Third Five Year Plan.

The Government of India appointed a Technical Committee to study and finalise the production programme of these two new units and also to advise them on the possible locations for their establishment. The recommendations of the Committee in regard to the items of manufacture are given below separately . After examining the proposals made by the various State Governments, the Committee recommended that the Heavy Electrical Eqiupment Plant with the U.S.S.R. collaboration should be located at Ranipur near Hardwar and the Heavy Power Equipment Plant with the Czech collaboration at Ramachandrapuram near Hyderabad. Government accepted these recommendations and the preliminary work on these projects is under way :—

Second & Third Heavy Electrical Projects

Heavy Electrical Project (second) with U.S.S.R. collaboration

Production programme	Initial (in million watts)	Ultimate Kilo-
(*i*) steam turbines and turbo alternators	0·75	1·5
(*ii*) hydro turbines & generators	0·60	1·20
(*iii*) large size motors	0·26	0·52

Estimated Capital outlay (I stage) . . Rs 35 to 40 crores.

Saleable output (I stage) . . . . Rs 25 crores.

Heavy Power Equipment Plant (third) with Czech collaboration

Production programme	Initial (in million watts)	Ultimate Kilo-
(*i*) steam turbines and turbo alternators	0·62	1·30
(*ii*) diesel engines	..	209,000HP

Estimated Capital outlay (I stage) . . . Rs. 27·0 crores.

Saleable ouput (I stage) . . . . . Rs. 12·0 crores.

Except, for the castings, forgings and a few other 'bought-out' components the plants are being designed to secure the maximum production of the equipment from within the works. The two plants will have their captive foundries designed to produce grey iron castings upto 5 tons piece weight. The foundry to be located as a part of the Czech unit at Hyderabad will meet the needs of the High Pressure Boiler Plant also. To fill up the uncovered

gaps for castings and forgings of the heavier types even after the full development of the Foundry and Forge Shop at Ranchi, further studies for the establishment of another central foundry forge unit are being carried out by the Heavy Electricals Ltd.

The detailed project reports are expected to be received in the third quarter of 1962 for the Czech project and in the last quarter of 1962 for the U.S.S.R. project whereafter agreements with the respective countries will be concluded for the supply of machinery and equipment. It is expected that production in these new plants will commence by the end of 1964. The first items in the series of the products to be manufactured are expected to come out of these factories before the end of the Third Plan.

It is proposed to develop the Heavy Electrical Equipment plants in such a manner that by the end of 1970, the country is able to avail of the full benefit of Rs. 50 crores production at Bhopal and the first stage programme of the U.S.S.R. and Czech Plants. The table below shows the production likely to be reached in the Heavy Electrical Projects in 1970 as against about Rs. 350 crores worth of output estimated for the last year of the Third Plan.

Table showing level of production likely to be reached in the Heavy Electricals Projects

Product	Unit	Production level in 1970			Total	Value of the Products (Rs. lakhs)
		Bhopal plant	USSR plant	Czech power plant		
Hydraulic turbines and generators.	(Megawatt) '000 KW	500	600	..	1,100	1,300
Steam turbines and turbo generators.	(Megawatt) '000 KW.	500	750	620	1,870	3,200
Power transformers . .	'000 KVA	6,000	..	..	6,000	1,400
Industrial motors and other allied equipment.	'000 KW. .	360	260	..	620	620
Traction motors and associated equipment.	'000 H.P. .	311	..	..	311	650
Switchgear—						
Circuit Breakers 11 KV	Nos.	2,500	..	..	2,500	1,050
,, ,, 33 KV	,,	500	..	..	500	
,, ,, 66 KV	,,	50	..	..	50	
,, ,, 110/132 KV	,,	150	..	..	150	
,, ,, 220 KV	,,	100	..	..	100	
,, ,, Traction Single Phase.	,,	100	..	..	100	
Control Panels and gears. . . .	L.S.	to match with the above programme				
Capacitors . . .	'000 KVA	54	..	..	54	
						8,220
						Or say Rs. 82 crores.

32. ELECTRIC TRANSFORMERS

1. Review of progress during the Second Plan:

Targets.—At the time of the formulation of the Second Five Year Plan, it was envisaged that the annual demand for transformers of 33KV and below on the H.T. side would be of the order of 1·36 million KVA per annum by 1960-61 and the corresponding installed capacity was placed at 1·5 million KVA. These targets were later on revised by the Development Council for Heavy Electrical Industries and placed at 1·5 million KVA and 2·2 million KVA for production and capacity respectively by 1960-61. The revised targets were accepted by the Planning Commission.

Capacity.—At the beginning of the Second Five Year Plan, there were 13 units engaged in the manufacture of power and distribution transformers with an annual capacity of 657,000 KVA. Since then five new units with a capacity of 261,000 KVA have gone into production and substantial expansions of capacity totalling 486,000 KVA have been effected by eight of the existing units. At the end of 1960-61, there were thus 18 units engaged in the manufacture of power and distribution transformers with an annual installed capacity of 1,404,000 KVA.

Details of the schemes which were completed during the Second Plan period are given below:

Name of the unit	Nature of scheme	Annual capacity as on 1-4-56 (KVA)	Annual capacity as on 1-4-61 (KVA)	Increase in capacity (KVA)
1	2	3	4	5
M/s. Gandhi Electric Industries (P) Ltd., Bombay	New Unit	..	5,000	5,000
M/s. Hack bridge-Hewittic & Easum (P) Ltd., Madras	New Unit	..	66,000	66,000
M/s. Transformer & Switchgear Ltd., Madras	New Unit	..	30,000	30,000
M/s. General Electric Co., Naini (U.P.)	New Unit	..	100,000	100,000
M/s. Pradip Lamp Works, Patna	New Unit	..	60,000	60,000
M/s. Electric Construction & Equipment Co., Calcutta	S.E.	4,000	104,000	100,000
M/s. Hindustan Electric Co., Howrah	S.E.	90,000	135,000	45,000
M/s. Radio Lamp Works Ltd., Bombay.	S.E.	12,000	42,000	30,000

1	2	3	4	5
M/s. Crompton Parkinson Works Ltd., Bombay	S.E. . .	108,000	192,000	84,000
M/s. Bharat Bijlee Ltd., Bombay .	S.E. . .	36,000	72,000	36,000
M/s. Radio & Electricals, Madras	S.E. . .	15,000	72,000	57,000
M/s. Government Electric Factory, Bangalore. (Public Sector Project).	S.E. . .	50,000	84,000	34,000
M/s. Kirloskar Electric Co., Bangalore	S.E. . .	75,000	175,000	100,000

The state-wise distribution of capacity, as on 1-4-56 and 1-4-61 of the units registered with the Development Wing is given below:

State	Capacity as on 1-4-1956		Capacity as on 1-4-1961	
	No. of Units	Capacity (KVA)	No. of Units	Capacity (KVA)
Maharashtra	4	264,000	5	491,000
W. Bengal.	5	243,000	5	420,000
Madras	1	15,000	3	198,000
Mysore	2	125,000	2	125,000
Kerala	1	10,000	1	10,000
Bihar	..	..	1	60,000
Uttar Pradesh	..	..	1	100,000
TOTAL .	13	657,000	18	1,404,000

Production.—The production of transformers since 1955-56 is given below:

	Production ('000 KVA)
1955-56	625
1956-57	1,033
1957-58	1,234
1958-59	1,096
1959-60	1,013
1960-61	1,392

The transformer industry has made considerable progress during the Second Plan period. The rated production capacity has considerably increased and production has shown a progressive increase over the 1955-56 level. The range of production of transformers has also considerably widened and diversified. While the majority of the units in the country have, by and large, confined themselves to the production of transformers up to 1,500 KVA and 33 KV on the H.T. side, a few units have established manufacture of higher voltage and higher capacity transformers. The production of transformers of larger ratings has also increased substantially. A large part of the requirements of transformers is at present being met from indigenous production.

Imports.—The number and type of transformers imported into the country were not recorded in the Foreign Trade and Navigation Accounts of India upto December, 1956. Since January, 1957 they are shown in number and type alongwith the value. Imports of transformers in terms of value were as follows:

	Value (Rs. lakhs)
1957	303·58
1958	251·74
1959	244·39
1960	247·13

Imports of transformers up to 1,500 KVA and up to 22 KV on the H.T. side are banned at present.

In regard to other types of transformers, licences are issued to established importers to the extent of 15 per cent of one half of their best year's imports. Actual users are also allowed to apply.

Exports.—There have been practically no exports of transformers during the Second Plan period.

Demand.—As is evident from the rising levels of indigenous production the demand for transformers has assumed an upward trend in line with the increase in the power generating capacity in the country. Due to some delay in the execution of power projects there was some shortfall in demand during 1959-60. Production, however, during 1960-61 has exceeded the target initially fixed for the industry. The requirement of distribution transformers is being almost entirely met from indigenous production and imports are mostly confined to transformers of higher ratings, production capacity for which is not sufficient in the country at present. As the demand for distribution transformers is being met from indigenous production and their imports are not very high, the demand may roughly be placed at about 1·39 million KVA during the last year of the Second Plan.

Heavy Electrical Project, Bhopal.—In view of the dependence of the country on foreign supplies for heavy equipment required in connection with the generation, transmission and utilisation of electricity, the Central Government decided to establish a factory at Bhopal in collaboration with M/s. A.E.I. of U.K. in 1955 to produce most of the types of heavy electrical equipment required in the country. This factory which went into production in July, 1960, has a programme for the manufacture of transformers of higher ratings.

Development Council.—In February, 1955, a Development Council for Heavy Electrical Industries was set up under the Industries (Development and Regulation) Act. The electric transformer industry comes within the purview of this council which has formulated recommendations regarding the development programme of this industry in the Third Plan.

Tariff Protection.—Protection was first granted to the transformer industry in 1952, when the Government accepted the Tariff Commission's recommendation that the import duty on power and disribution transformers up to 2,500 KVA and 33·5 KV on the H.T. Side (primary voltage being 250) excluding furnace rectifier and flame proof transformers should be increased from the then level of 5 per cent *ad valorem* exclusive of surcharge and converted into a protective duty. This protective duty was to remain in force till December 31st, 1955. The second enquiry was made in 1956 and the protective duty of 10 per cent *ad valorem* without surcharge was extended up to 31st December, 1960, and the duty was made available to power and distribution transformers up to 3,000 KVA and 37·5 KV on the H.T. side. Another enquiry by the Tariff Commission was conducted in 1960 and consequent upon the acceptance of its recommendations by the Government the protection has been extended up to 31st December, 1963, at the existing rates of the duty *i.e.* 10 per cent *ad valorem* and the duty has been made applicable to power and distribution transformers up to 10,000 KVA and 132 KV on the H.T. side and parts of such transformers not otherwise specified.

Quality of indigenous transformers.—The Tariff Commission in their 1960 report pointed out that the quality of indigenous transformers was generally satisfactory and comparable to that of imported ones, although some minor defects like oil leakage continued to persist for want of proper attention.

II. Programme of Development during the Third Plan period:

Estimated requirements.—The demand for transformers is essentially linked up with the generation and transmission of power and the utilisation of transformers at the various load centres. The Development Council for Heavy Electrical Industries has estimated that the demand for power and distribution transformers of 33 KV and below will rise to 3·5 million KVA per annum by the end of the Third Plan. In view of the accelerated growth of industrialisation and electrification during the Third Plan and the key role played by generation and transmission of electrical energy and requirement of transformers at various load centres, the demand for transformers will also grow rapidly. On the whole it seems reasonable to expect that the demand for power and distribution transformers of 33 KV and below will rise to 3·5 million KVA by 1965-66 as estimated by the Development Council for Heavy Electrical Industries.

Targets of capacity and production.—To achieve a production level of 3·5 million KVA by 1965-66, a capacity of 4·0 million KVA will be required on double shift by the same period.

Schemes licensed and under implementation.—Licences have been granted to one new unit and expansion of ten existing units giving altogether an additional capacity of 784,800 KVA. Details of the schemes are given below:

Name of the Unit	Nature of Scheme	Present annual capacity (KVA)	Additional capacity licensed (KVA)	Annual capacity when the schemes are implemented (KVA)
M/s. Bharat Bijlee Ltd., Bombay	S.E.	72,000	120,000	192,000
M/s. Electric Construction and Equipment Co. Ltd., Calcutta	S.E.	104,000	Capacity to be fixed.	104,000*
M/s. Crompton Parkinson Works Ltd., Bombay	S.E.	192,000	83,000	275,000
M/s. National Electrical Industries Ltd., Bombay	S.E.	108,000	72,000	180,000
M/s. Radio and Electricals, Madras	S.E.	72,000	30,000	102,000
M/s. Hack-bridge Hewittic & Easum (P) Ltd., Madras	S.E.	66,000	132,000	198,000
M/s. Transformer & Switchgear Ltd., Madras	S.E.	30,000	70,800	100,800
Govt. Electric Factory, Bangalore	S.E.	84,000	120,000	204,000
M/s. Indian Transformers Ltd., Alwaye	S.E.	10,000	40,000	50,000
M/s. Gandhi Electric Industries, Bombay	S.E.	5,000	45,000	50,000
M/s. Hindustan Electric Co., Baroda	N.U.	..	72,000	72,000

*Excluding the capacity for expansion.

Government Electric Factory, Bangalore.—This factory of the Mysore Government is the only one in the public sector for the manufacture of low rated transformers. This unit was licensed during the Second Plan period to step up the production of transformers to 204,000 KVA per annum. This expansion will be completed during the Third Plan. Besides the manufacture of transformers, this factory produces electric motors and switchgears A provision of Rs. 90·0 lakhs has been made under the Third Plan for the expansion of this factory.

Additional capacity required.—With the implementation of the schemes mentioned above, the rated capacity of the industry is expected to increase from about 1·40 million KVA to 2·19 million KVA per annum on single shift. As already mentioned, production of high rated transformers will be taken up by the Heavy Electrical Equipment Factory, Bhopal. By working the capacity on multiple shift, a production level of 3·5 million KVA can be achieved by the end of the Third Plan period and there is no need to license any more capacity during the Third Plan period. Once a capacity of about 1·8 million KVA is developed on single shift basis, it will not be necessary to take steps against infructuous licensing.

Requirements of raw materials.—A rough estimate of the requirements of raw materials for the production of 3·5 million KVA of transformers by 1965-66 is given below :

Mild Steel	11,000 tons.
Electrical steel sheets	13,900 ,,
Copper wires and strips	6,200 ,,
Insulating materials	1,800 ,,
Transformer bushings	232,000 ,,
Transformer oil	3,706,000 gallon.
Transformer cooling tubes	2,320,000 ft.

Of these electrical steel sheets, copper wires and strips, insulating materials and transformer cooling tubes are at present partly imported. As a number of schemes have been licensed for the manufacture of these items it will be possible during the Third Plan period to achieve self sufficiency in regard to most of these items.

The following table summarises the development of the transformer industry envisaged during the Third Plan period :

	(Million KVA)	
	1960-61	1965-66
Annual capacity	1·40	4·0
Production	1·39	3·5

33. ELECTRIC MOTORS

1. Review of progress in the Second Plan:

Targets.—At the time of the formulation of the Second Five Year Plan, it was envisaged that the annual demand for electric motors of 200 H.P. and below would be of the order of 0·6 million H.P. per annum by 1960-61. These targets were later on revised by the Development Council for Heavy Electrical Industries and placed at 0·8 to 1·0 million H.P. and 1·25 million H.P. for production and capacity respectively by 1960-61. The revised targets were accepted by the Planning Commission.

Capacity.—At the beginning of the Second Five Year Plan, there were 12 units engaged in the manufacture of electric motor with an annual capacity of 263,000 H.P. At the end of the Second Five Year Plan, there were 27 units engaged in the manufacture of electric motors with an annual capacity of 1,129,040 H.P.

The state-wise distribution of capacity was as under:

State	No. of units	Capacity (H.P.)
Maharashtra	5	308,600
West Bengal	6	279,240
Madras	11	121,000
Mysore	1	180,000
Gujerat	1	99,000
Andhra	1	6,000
Punjab	2	135,200
TOTAL	27	1,129,040

Small scale sector.—There has been considerable progress during the Second Plan period in the manufacture of electric motors in the small scale sector also. The number of manufacturing units increased from about 6 in 1955 to 74 in 1959 with an annual installed capacity of 2·66 lakh H.P. The production which stood only at 821 H.P. in 1955 increased to 70,064 H.P. in 1959. The total capital investment of the small scale units in 1959 was estimated at Rs. 1·41 crores and these units provided employment to about 2,890 persons. The small scale manufacturing units are concentrated at Bombay, Coimbatore, Calcutta and Delhi. In addition, there were about 39 units engaged in the manufacture of components only which are mainly concentrated in Mysore and W. Bengal. The volume of production in the small scale sector is mainly confined to fractional H. P. motors and motors up to 20 H.P.

Production.—The production of electric motors for the last 6 years has been as under:

	Production '000 H.P.
1955-56	272
1956-57	388
1957-58	507
1958-59	636
1959-60	575
1960-61	734

The above figures relate to the production of electric motors of the units borne on the books of the Development Wing, and in addition there are a number of small scale units producing electric motors and taking into account their production, it may well be stated that the target laid down for the Second Five Year Plan has, by and large, been achieved. The capacity for the manufacture of electric motors has increased substantially and the production has also shown a sizeable increase.

While the bulk of the production continued to be under 30 H.P., manufacture of motors of progressively higher H.P. ranges and special motors such as variable speed motors was also attempted.

Diversification.—There has been considerable diversification in the production of electric motors. Manufacture of special motors, such as variable speed motors, heavy duty motors and other types of special motors was taken up and in addition, a fairly large capacity was established for the manufacture of high horse power motors. Plans are under way for the manufacture of flame-proof and explosion-proof motors also.

Imports and exports.—Imports of electric motors since 1956 have been as under:

	'000 Nos.	Value (Rs. lakhs)
1956	58	195
1957	64	451
1958	33	352
1959	22	254
1960	31	266

The exports of electric motors have been practically negligible during the Second Plan period. A few motors were exported to Afganistan, Nepal etc. Actual exports of electric motors since 1957 have been as under:

	Nos.	Value (Rs.)
1957	13	5,168
1958	2	2,832
1959	316	110,352
1960	49	18,675

Consumption.—The demand for electric motors as is evident from the rising levels of indigenous production, has shown an upward trend in step with the increasing industrial activity in the country. Since the import figures for electric motors are not given in terms of H.P., it is difficult to arrive at a correct estimate of demand. Taking indigenous production and imports it is roughly estimated that the demand of electric motors during 1960-61 was of the order of 0·9 to 1·0 million H.P.

Quality of electric motors.—It is stated that the quality of indigenous electric motors is satisfactory. The indigenous manufacturers produce motors according to Indian standard specifications. While the performance of indigenous motors in the organised sector is stated to be generally satisfactory, a few complaints exist regarding certain imperfections in the motors like durability of ball bearings, early loosening of rotor etc. When these defects were brought to the notice of the manufacturers, they were rectified.

Tariff Protection.—The electric motor industry has enjoyed protection for over 10 years and recorded considerable progress during this period. The first enquiry into its claim for protection was held by the Tariff Board in 1946-47, as a result of which protection was granted in September, 1948 to all kinds of motors and existing revenue duty of 10% *ad valorem* was converted into an equivalent protective duty to remain in force upto March 31, 1950. The second enquiry into the industry was held by the Tariff Board in 1949. On the recommendations of the Board the protective rate was restricted to electric motors of the types actually manufactured in India *i.e.* motors upto 20 H.P. as well as component parts of such motors and the protection was extended upto March, 1953. Subsequently in consultation with the Tariff Commission, protection was further extended upto December 31, 1955. The Tariff Commission held another enquiry into the industry in 1955 as a result of which protection was granted for a further period of three years. Since September 7, 1955, a protective duty at the rate of 15% *ad valorem* was levied on imports of squirrel cage induction motors of H.P. above 20 and upto and inclusive of 100 and of slipring motors of H.P. ranging from 1 to 100 H.P. inclusive but excluding flame proof motors and variable speed commutator motors. A protective duty at the rate of 20% *ad valorem*

has also been levied on component parts of motors but excluding control gears. Another enquiry was held in 1958. The existing duty of 15% *ad valorem* on component parts of motors excluding control gears has been extended upto December, 1961. The Tariff Commission held another enquiry in 1960-61 into the question of continuance of protection to the electric motor industry beyond December, 1961 and consequent on the acceptance of the Commission's recommendations by the Government of India, the protection has been extended upto December 31, 1963. Protection will cover squirrel cage and slipring motors of 1 to 500 H.P. (excluding variable speed commutator motors), single phase motors of 1 to 3 H.P. and fractional H.P. motors of not less than ¼ H.P. with the existing level of duty of 15 per cent *ad valorem*. Duties on the import of component parts of the electric motors now brought under protection will be 20% *ad valorem*. Fractional H.P. motors of less than ¼ H.P. and component parts of such motors will be protected at the rate of 35% *ad valorem*.

Development Council.—A Development Council for Heavy Electrical Industries was set up in February, 1955 under the Industries (Development and Regulation) Act. The Council includes within its purview the electric motor industry. The Council has formulated recommendations regarding the development programme of this industry for the Third Plan.

II. Programme of Development in the Third Plan:

Estimated Requirements.—The demand for electric motors depends upon a number of factors like the industrial development which takes place in the country, availability of electric power, tendency to use electric motors for individual drive instead of group drive for industrial machines, development under agriculture etc. The volume and pattern of demand will however depend upon the pace at which various industries develop including those pertaining to manufacture of capital equipment and machine tools which require motors to be incorporated with them. The Development Council for Heavy Electrical Industries has estimated that the demand for electric motors upto 300 H.P. will increase to 2·5 million H.P. per annum by 1965-66. In view of the accelerated tempo of industrialisation and power generation envisaged during the Third Plan period, the demand for electric motors will also grow rapidly. On the whole it seems reasonable to expect that the demand for electric motor upto 300 H.P. will rise to 2·5 million H.P. by 1965-66 as estimated by the Development Council for Heavy Electrical Industries.

Targets of capacity and production.—To achieve a production level of 2·5 million H.P. by 1965-66, a capacity of 3·0 million H.P. on double shift has been proposed for establishment.

Schemes licensed and under implementation.—Licenses have been granted for substantial expansion of four existing units with a capacity of 390,500 H.P. and for establishing 23 new units with a capacity of 326,200 H.P. giving altogether an additional capacity of 716,700 H.P.

Details of the schemes licensed are given below:

Name of the Unit	Nature of the scheme	Capacity licensed (H.P.)
M/s. Electric Construction and Equipment Co., Calcutta	S.E.	36,000
M/s. Orient General Industries, Calcutta	S.E.	91,000
M/s. Jyoti Ltd., Baroda	S.E.	43,500
M/s. Kirloskar Electric Co., Bangalore	S.E.	220,000
M/s. Calcutta Fan Works, Calcutta	New Unit	3,000
M/s. Kastoori Engg. Ltd., Coimbatore	Do.	12,000
M/s. Laxmi Foundries, Coimbatore	Do.	17,500
M/s. Balasubramaniam Foundry, Coimbatore	Do.	3,000
M/s. Basant Engg., Baroda	Do.	3,000
M/s. Rama Krishna Metal and Alloy Industries, Coimbatore	Do.	3,000
M/s. Engg. Works of India (P) Ltd., Calcutta	Do.	50,000
M/s. Dandayanthapani Foundry, Coimbatore	Do.	25,000
Nahan Foundry, Nahan	Do.	15,000
Govt. Electric Factory, Bangalore	Do.	60,000
M/s. Shri Krishna Foundry, Coimbatore	Do.	3,000
M/s. Oriental Engg. Works (P) Ltd., Ambala or Jagadhri	Do.	6,000
M/s. Bharat Techno Mechanical Industries (P) Ltd., Navasari (Bombay).	Do.	3,000
M/s. Southern Engg. Industries, Coimbatore	Do.	3,000
M/s. Modern Engg. and Moulding Co., Ahmedabad	Do.	1,800
M/s. Govardhan Engg. Industries, Coimbatore	Do.	2,500
M/s. Navamani & Co., Coimbatore	Do.	2,500
M/s. Kumar Industries, Edathora (Kerala)	Do	3,000
M/s. General Electric Co., Madras	Do.	2,500
M/s. Indian Electric Tools Corporation, Faridabad	Do.	65,000
M/s. Southern Industrial Corporation, Madras.	Do.	30,000
M/s. New India Electric Corporation, Bombay	Do.	10,000
M/s. Jaura Engg. Works, Amritsar.	Do.	2,400

Out of the schemes licensed, two are public sector projects *viz.*, Government Electrical Factory, Bangalore and Nahan Foundry, Nahan. The Government Electric Factory, Bangalore is a wholly owned unit of the Government of Mysore. This is one of the oldest factories manufacturing transformers and they have been granted a license to manufacture 60,000 H.P. of electric motors. This expansion is expected to be completed during the Third Plan. A provision of Rs. 90·0 lakhs has been made in the Third Five Year Plan for the expansion of this factory.

Nahan Foundry, Nahan is a Central Govt. Project under the Ministry of Commerce and Industry. Besides the manufacture of other items like sugar cane crushers, metric weights etc., they have recently started the production of electric motors.

Fractional horse power motors.—Besides the above schemes, 18 firms with a capacity of 218,400 nos. have been licensed for the manufacture of fractional H. P. motors in the large scale sector.

Additional capacity required.—With the implementation of the schemes mentioned above (excluding fractional H. P. motors) the rated capacity of the industry will increase to about 1·85 million H. P. on single shift. The production target fixed for the Third Five Year Plan *viz.*, 1965-66, is 2·5 million H. P. and to achieve this, a capacity of the order of 3·0 million H. P. has been proposed for establishment on double shift. *Prima facie* production corresponding to the estimated demand of 2·5 million H. P. can be achieved by operating this capacity on double shift and there is no need to license any more capacity during the Third Plan period.

Mention may be made of the two Heavy Electrical Projects to be established at Ramachandrapuram near Hyderabad and Ranipur in Saharanpur district of U. P., with the Czeck and Russian collaboration respectively during the Third Plan. It is proposed to manufacture A. C. Industrial Motors of 200 H.P. and above in the project to be established with Russian collaboration. Scope and other aspects of the project are discussed under the Heavy Electrical Equipment Industry.

Raw materials.—Requirements of main raw materials for production target of 2·5 million H.P. are estimated to be as follows:

Pig iron & ferrous castings	31,000 tons.
Electrical steel sheets	31,000 tons.
Mild steel rods, bars, sheets etc.	4,700 tons.
Copper wires, strips, ingots and aluminium ingots	4,000 tons
Insulating materials	300 tons.
Ball and roller bearings	600,000 nos.
Insulating paints and varnishes	12,500 gallons.

Of these pig iron and ferrous castings, mild steel rods, bars and sheets and ball and roller bearings are available indigenously. Complaints about the unsatisfactory performance of ball bearings still exist. Steps have however been taken to improve the quality of indigenous bearings. Some items like insulating materials, paints and varnishes, copper wires and strips and aluminium ingots are partly imported. It is expected that the requirements of all the raw materials will be available indigenously by the end of the Third Plan

The following table summarises the development programme of the electric motor industry envisaged during the period of the Third Plan:

	(million H P.)	
	1960-61	1965-66
Capacity	1·13	3·0
Production	0·73	2·5

34. SWITCH GEAR AND CONTROL GEAR

(11 k. v. & below)

1. Review of Progress in the Second Plan :

Demand.—The requirements of switch gear and control gear are intimately linked with the power generation in the country. No development programme for these items was out-lined under the Second Plan and no targets were set. The following demands for 1960-61 were estimated by the Development Council for Heavy Electrical Industries :

H. T. switch gear	1,600 Nos.
L. T. switch gear	3,000 „
Motor control gear	120,000 „
Iron clad switch & switch fuse	600,000 „

Installed capacity & production.—Prior to 1953 there was hardly any production of these electrical items in the country. In the later years of the First Plan and particularly in the Second Plan period, rapid strides have been made in this field and by 1960, there were 26 establishments in operation. Several of the manufacturers have entered into technical collaboration arrangements with a view to gaining ready acceptance for their products from the indigenous customers. The installed capacity at the end of the Second Plan for switch gear manufacture was as under :

H. T. switch gear	330 Nos.
L. T. switch gear	1,000 „
Motor control gear	81,700 „
Iron clad switches and switch fuses	136,000 „

The state-wise distribution of this capacity is given below :

State	H. T. Switch gear (Nos.)	L. T. Switch gear (Nos.)	Motor control gear (Nos.)	I. C. Switch & Switch fuse (Nos.)
Delhi	..	..	..	18,000
Madras	..	..	300	24,800
Maharashtra	330	1,000	48,800	300
Punjab	..	..	4,800	2,400
Uttar Pradesh	..	..	..	14,400
West Bengal	..	..	27,800	76,100
TOTAL	330	1,000	81,700	136,000

The production of various types of switch gear and control-gear in the Second Plan period covered electric motor starters such as contact starters, star delta starters, stator-rotor starters and other special types of starters. In the case of low voltage switch gear, the indigenous manufacture covered oil and air circuit breakers upto 1,200 amperes. Further, large numbers of low voltage iron clad switches and switch fuse units have also been produced and more recently, the manufacture of high rupturing capacity fuses has also been established by one of the entrepreneurs. The actual production of switch gear and control gear increased from about Rs. 0·4 crore in 1955 to Rs. 4 crores in 1960 as shown below:

	Rs. crores
1955	0.40
1956	0·45
1957	1·35
1958	1·98
1959	2·25
1960	4·00

Exports.—There has been practically no export of these items so far because the industry is still in its infancy.

Import.—Despite the steep increase in the production capacity in the country, the requirements of switch gear and control gear could not be met in full and large-scale imports had to be arranged between 1957 and 1960 as shown below :

	Rs. crores
1957	12·90
1958	10·23
1959	11·18
1960	11·10

Development Council.—Switch gear and control gear come within the purview of the Development Council for the Heavy Electrical Industries.

II. Programme of Development in the Third Plan :

Estimated demand and Targets.—The demand for switch gear and control gear depends to a large extent on the increase in power generation during the Third Plan period. Taking into consideration the targets fixed for power development in the Third Plan, the Development Council for Heavy Electrical Industries estimated the capacity and production targets for switch gears upto 11 K. V. for the Third Plan period. Its estimate for 1965-66, which has recently been under review by the Development Council, is tentatively accepted as the basis for expansion of this industry under Third Plan.

The Development Council's estimate is indicated below:

	Demand (Nos.)	Capacity (Nos.)
11 K. V. circuit breakers and switch boards	2,250	2,650
L. T. circuit breakers and switch boards	18,000	21,000
Iron clad switches	3·6 millions	4·2 millions
Motor starters	2·25 lakhs	2·65 lakhs.

Schemes under implementation.—Several proposals made by the private entrepreneurs in the manufacture of switch gear have been approved by the Government for implementation. The State-wise distribution is shown below :

State	H.T. switch gear (Nos.)	L.T. switch gear (Nos.)	Motor Control gear ('000 nos.)	Iron clad switches & switch fuses ('000 nos.)
Delhi	..	..	41	33
Gujarat	200	600	56	21
Madras	180	360	32	84
Maharasthra	680	2,070	82	912
Mysore	340	600	37	10
Punjab	..	..	33	216
West Bengal	454	1,598	35	475
TOTAL	1,854	5,228	316	1,751

Capacity in the public sector.—Other than the Government Electric Factory, Bangalore owned and operated by the Government of Mysore, the Heavy Electrical Plant at Bhopal will also manufacture switch gear and control gear. While this factory is mainly intended to cater for the needs of equipment in the higher ranges, its production programme also includes the manufacture of 2,500 nos. 11 k. v. circuit breakers annually. Industrial control gear will also be manufactured in this plant to the extent needed for the motors produced in this factory. It is expected that during 1961-62 and 1962-63 as many as 1,165 and 2,200, 11 k. v. circuit breakers will be manufactured at the Bhopal plant of rupturing capacities upto 250 MVA. Switch gears of higher rupturing capacity—350 MVA, will be produced from 1963-64 onwards. Before the end of the Third Plan, the factory is expected to reach its targetted production.

Overall position.—The output from the private sector as well as the Heavy Electricals Limited at Bhopal is expected to meet the demands of the H. T. Switch gear for the country, adequately. For motor starters, the total of the existing installed capacity and licensed capacity comes to 4 lakh numbers whereas the target envisaged is only 2·65 lakh nos. Releases of foreign exchange have to be selective and made in favour of entrepreneurs who have secured the most advantageous terms. In this manner, it should

also be the endeavour to secure the progress in installed capacity broadly in step with the target for the Third Plan and utilisation of capacity on double shift basis. For L. T. circuit breakers and iron clad switches, the aggregate of capacity already installed and the capacity licensed comes to 6,228 numbers and 1.89 million numbers respectively. Taking into consideration the need and possibilities for double shift working, these figures could correspond to about 11,200 numbers and 3·4 million numbers respectively.

Raw materials.—The essential pre-requisite in the manufacture of switch gears and control gears is the ready availability of basic raw materials of correct quality and grade, like extruded steel sections, extruded brass and copper section for electrical purposes, phospher bronze, spring steel, wires and strips, bright free cutting steel, special silver alloy, contact materials, bimetal strips, paper laminated insulating bars and tubes, procelain and steatite bushings and insulators, electrical grade thermo-setting powder and casting resins. A number of these materials are yet to be produced in the country.

35. ELECTRICAL CABLES AND WIRES

1. Review of progress in the Second Plan:

Targets.—The Second Plan for electric cables and wires envisaged the following targets of capacity and production for 1960-61:

Name	Unit	Targets for 1960-61	
		Capacity	Production
A. C. S. R. conductors	tons	21,570 (30,000)	18,000 (20,000)
Bare copper conductors	"	27,800	10,000 (15,000)
Winding wires	"	4,486	4,000
Rubber and plastic coated cables	yds.	334·4 million core (500/600 million core)	250·0 million
Telephone cables	miles	1,000	1,000
Coaxial trunk cables	"	300	300
Paper insulated power cables	"	784 (1,800)	600 (1,600)

Note.—Within brackets are mentioned the target figures subsequently estimated by the Development Council for Heavy Electrical Industries and accepted by the Planning Commission

Capacity

(i) *A. C. S. R. and all Aluminium conductors.*—At the beginning of the Second Five Year plan, there were five units engaged in the manufacture of A. C. S. R. and All Aluminium conductors with an annual capacity of 13,370 tons. During the Second Plan period two new units *viz.* M/s. Power Cables, Kalyan and M/s. Aluminium Industries Ltd., Hirakud with a capacity of 5,700 tons went into production and marginal expansions were also carried out in some of the existing units. At the end of 1960-61, there were thus seven units with an annual capacity of 19,300 tons on double shift as assessed by the Development Wing.

(ii) *Bare copper conductors.*—During the Second Plan period there has been no addition to the installed capacity of 18,700 tons of the six units engaged in the manufacture of bare copper conductors.

(iii) *Winding Wires.*—(a) *Enamel covered winding wires.*—At the beginning of the Second Plan period, there were three firms engaged in the manufacture of enamel covered winding wires with an annual capacity of 698 tons. During the Second Plan period five new units with a capacity of 3,534 tons per annum went into production and substantial expansion was carried out by one of the existing units with a capacity of 360 tons per annum giving altogether an additional capacity of 3,894 tons. At the end of 1960-61, there were thus eight units engaged in the manufacture of enamel covered winding wires and the installed capacity of these units was 4,592 tons per annum.

Details of the schemes which were completed during the Second Plan period are given below:

Name of the unit	Nature of the scheme	Annual capacity as on 1-4-56 (tons)	Annual capacity as on 1-4-61 (tons)	Increase in capacity (tons)
M/s. Devi Dayal Industries (P) Ltd., Bombay.	S.E.	158	518	360
M/s. Electrical Industries Corp., Calcutta	N.U.	..	1,560	1,560
M/s. Hindustan Wire Products Ltd., Patiala.	,,	..	500	500
M/s. Hindustan Transmission Products. Ltd., Bombay.	,,	..	924	924
M/s. Enamelled Wires (P) Ltd., Bombay	,,	..	300	300
M/s. Ajit Industries, Bombay	,,	..	250	250

(b) *Paper and cotton covered winding wires and strips.*—At the beginning of the Second Plan, there were two units in production with a capacity of 756 tons per annum. During the Second Plan period five new units went into production with a capacity of 1,045 tons and substantial expansion was effected in the two existing units with a capacity of 384 tons, giving altogether an additional capacity of 1,429 tons. At the end of 1960-61, there were thus seven units engaged in the manufacture with an installed capacity of 2,185 tons on double shift basis.

Details of the schemes which were completed during the Second Plan period is given below :

Name of the unit	Nature of the scheme	Annual capacity as on 1-4-56 (tons)	Annual capacity as on 1-4-61 (tons)	Increase in capacity (tons)
M/s. Indian Cable Co. Ltd., Calcutta	S.E.	576	720	144
M/s. National Insulated Cable Co. of India Ltd., Calcutta.	,,	180	420	240
M/s. Devi Dayal Cable Industries (P) Ltd., Bombay.	N.U.	..	315	315
M/s. Shakti Trading Co., Bombay	,,	..	300	300
Hindustan Wire Products Ltd., Patiala	,,	..	100	100
M/s. Electrical Industries Corporation, Calcutta.	,,	..	180	180
M/s. Jayant Metal Mfg. Co. Ltd., Bombay.	,,	..	150	150

(iv) *Rubber and Plastic insulated cables.*—At the beginning of the Second Five Year Plan, there were nine units engaged in the manufacture of rubber and plastic insulated cables with an annual capacity of 172·5 million core yds. During the Second Plan period, 13 new units with a capacity of 156·5 million core yds. went into production and substantial expansion of capacity totalling 184·21 million core yds. was carried out by

four existing units. At the end of 1960-61, there were thus 22 units engaged in the manufacture of rubber and plastic insulated cables with an annual capacity of 463·24 million core yds. on double shift.

Details of the schemes which were completed during the Second Plan period are given below:

Name of the unit	Nature of scheme	Annual capacity as on 1-4-56 (million core yds.)	Annual capacity as on 1-4-61 (million core yds.)	Increase in capacity (million core yds.)
1	2	3	4	5
M/s. Indian Cable Co., Calcutta	S.E.	67·80	157·44	89·64
M/s. National Insulated Co. of India, Calcutta	S.E.	48·00	68·00	20·00
M/s. South India Rubber Works, Bombay (M/s. Premier Rubber and Cable Industries Ltd.)	S.E.	3·00	12·00	9·00
M/s. Reliable Electric and Cable Co., Delhi	S.E.	9·40	25·00	15·60
M/s. Aluminium Industries, Kundara	N.U.	..	6·00	6·00
M/s. Bombay Cable Co. Ltd., Bombay	N.U.	..	24·00	24·00
M/s. Moti Electrical Industry, Delhi	N.U.	..	3·60	3·60
M/s. Bhagwan Dass Babu Ram, Delhi	N.U.	..	22·10	22·10
M/s. Bharat Cable Ltd., Bombay	N.U.	..	10·00	10·00
M/s. Swastik Rubber Products Ltd., Poona	N.U.	..	12·00	12·00
M/s. Indian Wire Products Ltd., Aligarh	N.U.	..	3·00	3·00
M/s. Cable Corporation of India Ltd., Bombay	N.U.	..	20·00	20·00
M/s. Fort Gloster, Calcutta	N.U.	..	27·60	27·60
M/s. Shashi Brothers (P) Ltd., Bombay	N.U.	..	18·00	18·00
M/s. Devi Dayal Cable, Bombay	N.U.	..	1·80	1·80
M/s. Plastic Moulders (P) Ltd., Calcutta	N.U.	..	2·40	2·40
M/s. Diamond Rubber Works, Bombay	N.U.	..	6·00	6·00

(v) *Telegraph and telephone cables and wires.*—The Government Dry Core Cable Factory *viz.* Hindustan Cables Ltd., Rupnarainpur is the only firm manufacturing telephone cables with an annual capacity of 471 miles on single shift. It produced 1,077 miles of dry core telephone cables valued at Rs. 1·50 crore during 1960-61. It also commenced manufacture of coaxial cables since July, 1960 and produced 57 miles of coaxial cables valued at Rs. 13·62 lakhs during 1960-61.

(vi) *Paper insulated power cables.*—At the beginning of the Second Five Year plan there was no unit manufacturing paper insulated power cables. During the Second Plan period two new units *viz.* M/s. Indian Cable Co., Calcutta and M/s. Cable Corporation of India Ltd., Bombay went into production with an annual capacity of 884 miles. At the end of 1960-61, there were thus two units engaged in the manufacture of paper insulated power cables with an annual capacity of 884 miles on double shift.

The state-wise distribution of electric cables and wires industry was as under:

State	No. of Units	Bare copper conductors (tons)	A.C.S.R. conductors (tons)	Winding Wires Enamel covered (tons)	Wires Paper and cotton covered (tons.)	Rubber & Plastic insulated cables (million core yds.)	Paper Insulated (miles)
Maharashtra	15	1,200	3,300	1,992	765	122·10	500
W. Bengal	9	14,500	6,600	2,100	1,320	255·44	384
Kerala	1	..	4,000	..	..	6·00	—
Rajasthan	1	3,000	..	..	—	—	—
Orissa	1	..	2,400	..	—	—	—
Punjab	2	..	3,000	500	100	..	..
Mysore	1	..	..	..	..	20·00	..
Delhi	5	..	..	..	..	56·70	..
Uttar Pradesh	1	..	..	..	..	3·00	..
TOTAL	36	18,700	19,300	4,592	2,185	463·24	884

Production.—Actual production of various types of cables and wires during the last six years has been as follows:

	A.C.S.R. conductors (tons)	Bare copper conduc- (tors tons)	Winding Wires (tons)	Rubber insulated cables (million yds.)	Paper insulated power cables (miles)	Telephone cables (miles)
1955-56	8,730	8,536	670	86·90	..	525
1956-57	12,391	9,758	802	107·44	..	591
1957-58	15,511	8,004	1,113	106·20	..	538
1958-59	14,571	7,166	2,453	139·49	245	656
1959-60	15,325	7,216	3,180	174·37	445	691
1960-61	23,561	10,700	4,582	214·20	620	1,077

The Electric cables & wires industry has made considerable progress during the Second Plan period. Its rated capacity has considerably increased and the production has shown more or less a progressive increase over 1955-56 level.

Imports.—Imports of different varieties of cables and wires in terms of value have been as follows for the last four years:

	Imports (Rs. lakhs)
1957	1,084·00
1958	772·90
1959	583·76
1960	415·18

Exports.—There has not been much progress in the export of electric cables and wires during the Second Plan period. Some cables and wires were however exported to Middle East and South-East Asian countries. Exports since 1957 in terms of value have been as follows:

	Export (Rs. lakhs)
1957	0·58
1958	0·50
1959	1·07
1960	2·79

Consumption.—On the basis of production and imports the indigenous availability of various kinds of cables and wires during the last six years was as under:

	Bare copper conductors (tons)	A.C.S.R. (tons)	Winding wires (tons)	Plastic Insulated (million yds.)
1955-56	8,710	9,010	2,000	123·1
1956-57	10,373	13,937	1,494	131·1
1957-58	8,120	20,966	2,993	141·6
1958-59	7,294	16,297	3,295	151·6
1959-60	7,249	19,736	3,830	182·1
1960-61	10,750	25,700	4,720	250·0

The consumption of all kinds of cables and wires has shown more or less a progressive increase during the Second Plan period. The demand for A. C. S. R. conductors is rising at a faster rate as compared to bare

copper conductors. This is due to the present trend of using more A. C. S. R. conductors for power transmission owing to short supply and high cost of electrolytic copper.

Development Council.—A Development Council for Heavy Electrical Industries was set up in February, 1955. The Electric cables and wires industry comes within the purview of this council.

Capital and Labour.—A sum of about Rs. 8·0 crores is estimated to have been invested by the cables and wires industry during the Second Plan period on schemes completed and under implementation. In addition, a sum of about Rs. 0·4 crore has been spent on the factory of the Hindustan Cables in the public sector.

The number of persons employed in the industry at the end of the Second Plan is estimated at 8,000 as against 3,800 employed at the beginning of the Second Plan.

II. Programme of Development in the Third Plan :

Estimated requirements and targets of capacity and production.—The demand for cables and wires depends mainly upon the extent to which power is transmitted and distributed and this cannot be forecast with too great precision. However, in relation to the power development programme envisaged for the Third Plan, the following estimates of requirements of various kinds of cables and wires have been made :

(i) *A. C. S. R. conductors.*—The volume of demand for these types of conductors would depend entirely on the extent of the transmission system that will be constructed in the Third Plan period and the extent to which the bare copper conductors are replaced by A. C. S. R. conductors. Considering these aspects, it is expected that the demand for A. C. S. R. conductors would rise to 44,000 tons in 1965-66 as against about 25,000 tons in 1960-61. To achieve a production level of this order, a capacity target of 55,000 tons, on double shift has been proposed for establishment for 1965-66.

(ii) *Bare copper conductors.*—Due to lack of indigenous copper resources and the heavy foreign exchange bill involved in its imports, there is a tendency to use aluminium conductors in place of copper conductors. In view of this trend the demand for bare copper conductors is not likely to increase. The strategy is to find ways and means of reducing the demand for copper to the bare minimum. Though it has been assumed that the requirements of copper conductors would be 15,000 tons in 1965-66, the demands are capable of substantial reduction if additional supplies of indigenous aluminium could become available.

(iii) *Winding wires.*—Winding wires are mostly used for transformers, electric motors, fans, fluorescent chokes etc. and other types of electrical equipment. In relation to the targets proposed for these items under the Third Plan, it has been estimated by the Development Council for Heavy Electrical Industries that the demand for winding wires would rise to 24,000 tons per annum (15,000 tons

enamel covered and 9,000 tons paper and cotton covered) by 1965-66. The Council has proposed a capacity of 32,000 tons to be established on double shift by 1965-66.

(iv) *Rubber and plastic insulated cables.*—The demand for rubber and plastic insulated cables is expected to increase to about 600 million yards during 1965-66 as against a demand of about 250 million yards during 1960-61. To achieve production of this level, a capacity of 800 million yards on double shift has been proposed for establishment by 1965-66.

(v) *Telegraph and telephone cables and wires.*—It is estimated that the demand of dry core cables for the expansion programme of Post and Telegraph Department would be about 2,000 miles during 1965-66. To achieve this production, a capacity target of 2,000 to 2,500 miles has been proposed for establishment on double shift.

In addition to above about 300 miles of coaxial cables will be required for linking major cities in India by an underground telephone cable network.

(vi) *Paper insulated power cables.*—It is estimated that the demand of paper insulated power cables would rise to 4,000 miles per annum by 1965-66. To achieve this production, a capacity of 4,500 miles has been proposed for establishment on double shift by 1965-66.

Schemes licensed.—Licences have been granted for establishing additional capacity of the order of 22,600 tons of A. C. S. R. and All Aluminium conductors, 502·62 million core yards of V. I. R. and P. V. C. cables, 3,992 miles of paper insulated power cables and 5,384 tons of winding wires on double shift. Beside the above schemes, a few more have been licensed for A. C. S. R. conductors, V. I. R. and P. V. C. cables and winding wires but their capacity is proposed to be assessed when they go into regular production.

Expansion of Hindustan Cables.—Besides the above schemes, the Hindustan Cables, Rupnarainpur will be expanded during the Third Plan period to produce 2,000 miles of dry core cables and 500 miles of plastic insulated city cables on double shift. It has already started the production of coaxial cables and will produce 300 miles of coaxial cables per annum by the end of Third Plan. A provision of Rs. 350 lakhs has been made in the Third Plan for the expansion of this project.

Additional capacity required.—With the implementation of these schemes the capacity for the manufacture of various types of cables and wires is expected to be as follows:

A.C.S.R. conductors	41,900 tons.
Bare copper conductors	18,700 tons.
Rubber insulated cables	965·86 million core yds.
Paper insulated cables	4,876 miles.
Winding wires:	
(*i*) Enamel covered wires	7,102 tons.
(*ii*) Paper and cotton covered wires and strips	5,059 tons.

The above capacities do not include the capacity of the units which have been licensed but whose capacities will be decided when they go into regular production. It will be seen that except in the case of winding wires, there is no scope for creating additional capacity during the Third Plan to meet the estimated requirements of various types of cables and wires by 1965-66. Till the capacity of all the units licensed to manufacture winding wires, A. C. S. R. conductors and V. I. R. and P. V. C. cables is fixed, it does not appear necessary or desirable to consider fresh licensing in this field. The position should be reviewed when the capacities of all the units are finally fixed on the basis of technical consideration and keeping in view the objection of double shift operation of plant facilities.

As regards the telephone cables and coaxial cables, it is hoped that the production of Hindustan Cables will meet the requirements of Third Plan.

Raw materials.—The requirements of principal raw materials for the target of production envisaged fot various types of cables and wires by 1965-66 have been roughly estimated as follows:

	Quantity (tons)
High tensile steel wire	15,000
Copper	70,000
Aluminium	50,000
Lead for sheathing	10,000
Speciality Paper	2,000
Cotton cloth ('000 sq. yards)	2,500
Impregnating compounds	3,000
P.V.C. compound	8,000

The above excludes the raw material requirements of telephone cables and coaxial trunk cables. About 80% of the raw materials are available from indigenous sources; some insulating materials and electrolytic copper are being imported. It is hoped that country will become self sufficient in all the raw materials during the Third Plan.

The following table summarises the programme of development for the electric cables and wires industry during the Third Plan period:

	1960-61		1965-66	
	Capacity	Production	Capacity	Production
A.C.S.R. Conductors (tons)	19,300	23,561	55,000	44,000
Bare Copper Conductors (tons)	18,700	10,700	18,700	15,000
Winding Wires—				
(*i*) Enamel covered (tons)	4,592	3,830	20,000	15,000
(*ii*) Paper, cotton etc. covered wires and strips (tons)	2,185	1,115	12,000	9,000
Rubber and plastic coated cables (million yds.)	463·24	214·2	800·0	600·0
Telephone Cables (miles)	471*	1,077	2,000 to 2,500	2,000
Coaxial Trunk Cables (miles)	300	57	300	300
Paper insulated Power Cables (miles)	884	620	4,500	4,000

*Single shift capacity.

36. ELECTRIC FANS

1. Review of Progress in the Second Plan:

Targets.—At the beginning of the Second Plan, the Planning Commission envisaged that the installed capacity for electric fans would increase from 401,700 numbers in 1955-56 to 600,000 numbers in 1960-61.

The demand was expected to rise from 280,000 to 550,000 nos. by 1960-61 and exports to reach 50,000 numbers by the same period. It was visualised that if the demand is in excess of the estimated level, production could be stepped up by more intensive utilisation of the capacity.

Capacity and production.—In 1955-56 there were 19 units manufacturing electric fans with an annual installed capacity of 401,700 numbers. Since then 6 new units with an annual installed capacity of 29,250 nos. have come into production. Out of the existing units, eight have carried out substantial expansions, and the capacity of one unit has been reassessed, the overall capacity has thus risen by 440,800 fans per year. At the end of 1960-61 there were in all 24 units with an installed capacity of 871,750 nos. per annum on single shift basis.

The State-wise distribution of the installed capacity as on 1st April, 1956 and 1st April, 1961 is given below:

State	Position as on 1-4-1956		Position as on 1-4-1961	
	No. of Units	Annual installed capacity (nos.)	No. of Units	Annual installed capacity (nos.)
West Bengal	11	315,200	11	700,000
Maharashtra and Gujarat	4	62,000	7	148,850
Punjab	..	..	3	14,400
Uttar Pradesh	1	1,000	1	3,000
Delhi	3*	25,500	2	5,500
TOTAL	19	401,700	24	871,750

*The Delhi factory of M/s Matchwell Electricals (I) Ltd., has been merged wiih their Poona factory.

Production.—The production of electric fans for the last few years has been as follows:

	Numbers
1955-56	287,336
1956-57	380,271
1957-58	562,352
1958-59	648,162
1959-60	793,742
1960-61	1,058,151

During the Second Plan period the production of electric fans has shown an increase of about 270 per cent and the target of production set for 1960-61 has been substantially exceeded. The industry is now manufacturing almost the entire range of electric fans such as ceiling fans, table fans, pedestal fans, air circulators, railway carriage fans and exhaust fans. Many new designs and models have been introduced during the last few years.

Apart from the units operating in the large scale sector, production of electric fans is also undertaken in the small scale sector. The small scale industry is mostly concentrated in the Punjab, Maharashtra and West Bengal. Though these units manufacture all types of fans there is a measure of regional specialisation in different types *e.g.* in the eastern region small units mostly manufacture ceiling fans while in the northern region production of table fans is more popular with the small scale units. Similarly units in the Western region produce more of industrial fans than other types. According to data available the production of electric fans in the small scale sector increased from about 12,800 in 1955 to about 62,300 in 1959.

Imports.—In the first year of the Second Plan, import of ceiling fans was banned but the import of table fans and pedestal fans was allowed to the extent of 10 per cent of the best year's imports. After June, 1957, even, the import of table and pedestal fans was completely banned. The imports of industrial exhaust fans and blowers, which was allowed liberally was restricted to 66⅔ per cent of the best year's imports under the import policy for January-June, 1957. Gradually this quota has been reduced to import of 20 per cent general and 20 per cent soft currency area of the best year's imports.

Actual imports of electric fans were as follows during the last few years:

	No. of Fans	Value in Rs.
1956	N.A.	1,963,796
1957	2,834	343,433
1958	296	60,034
1959	37	3,146
1960	Neg.	Neg.

The value of imports fell from Rs. 19·6 lakhs in 1956 to Rs. 88,000 only in 1959. In the year 1960 the imports were reduced to a negligible figure.

Exports.—The electric fans industry is contributing substantially to the export trade of the country. It was expected that the exports of electric fans would increase from 17,000 numbers in 1955-56 to 50,000 numbers in 1960-61. As will be seen from the following data the exports have reached a figure of 39,440 numbers in 1959 and in the year 1960 they went up to 96,019 numbers:

	No. of fans	Value in Rs.
1956	12,629	1,463,407
1957	15,471	1,731,820
1958	21,379	2,204,969
1959	39,448	3,926,101
1960	96,019	8,674,059

Indian fans were exported, to several countries.

Consumption.—The number of electric fans available for the internal market during the last five years, based on actual production plus imports minus exports was as follows :

	Production (nos.)	Import (nos.)	Export (nos.)	Quantity available for the internal market (nos.)
1956-57	380,271	2,000**	12,629	369,642
1957-58	562,352	2,834*	15,471*	549,715
1958-59	648,162	296*	21,379*	627,079
1959-60	793,742	37	39,448*	754,331
1960-61	1,058,151	Neg.	96,019*	962,132

*Figures relate to calendar years.

**Estimated.

The availability of electric fans has more than doubled during the period of the Second Five Year Plan.

Capital investment and employment.—It is estimated that a sum of Rs. 75·0 lakhs was invested in this industry during the period of the Second Plan. At present the industry provides employment to about 8,000 persons.

II. *Programme of Development in the Third Plan:*

Estimated requirements.—The demand for electric fans more than doubled during the Second Plan period. This rising trend of demand will continue as a result of the availability of electricity in new areas, more electricity in old electrified areas, improvement in the standard of living and the increased industrial activity and construction of new factories, staff quarters and houses. Electrical fans have now come to be regarded as essential durable consumer goods of widespread use. It is estimated that with the same rate of increase as during the Second Plan, the domestic demand for electric fans will increase from its present level of about 900,000 numbers to 2·25 million numbers by 1965-66.

In addition to domestic demand, electric fans will also be required for export purposes. Apart from ceiling fans which will continue to figure under exports, it is felt that with improvements in design and finish, there is scope for export of table and pedestal fans also. It is envisaged that exports could be increased to about 250,000 numbers by 1965-66. Thus the overall requirements of electric fans will be of the order of 2·5 million numbers by the last year of the Third Plan.

Target of capacity and production.—As the overall requirements of electric fans by 1965-66 are estimated at 2·5 million numbers production on the same scale is envisaged in that year. A capacity of 2·8 million numbers is planned on double shift basis allowing 80 per cent utilisation of the capacity in the second shift. This is equivalent to a capacity of 1·4 million reckoned on single shift.

Schemes licensed and under implementation.—A number of projects have been licensed during the Second Plan period. Details of these schemes are given below:

Firms	Nature of the scheme	Existing capacity (nos.)	Capacity after scheme has been completed (nos.)
1	2	3	4
M/s. Oriental General Industries Ltd., Calcutta.	S.E.	192,000	300,000
M/s. Bharat Electrical Industries Ltd., Calcutta	S.E.	15,000	39,500
M/s. Engineering Works of India Ltd., Calcutta	S.E.	24,000	30,000
M/s. Crompton Parkinson Works Ltd., Bombay	S.E.	35,000	84,000
M/s. Rampur Engineering Works Ltd., Rampur	S.E.	3,000	30,000
M/s. Matchwell Electricals Ltd., Poona	S.E.	84,000	114,000
M/s. Orient Engineering Works, Amritsar	N.U.	..	2,400
M/s. Ganesh Flour Mill, Delhi	N.U.	..	75,000
M/s. Jay Engineering Works Ltd., Calcutta	S.E.	318,000	600,000

1	2	3	4
M/s. General Electric Co. of India Ltd.	S.E.	24,000	86,000
M/s. Jaura Engg. Works Pt. Ltd., Amritsar	S.E.	3,600	8,400
M/s. Ajit Industries, Bombay	N.U.	..	30,000
M/s. Universal Engg. Works, Amritsar	S.E.	6,000	16,800
M/s. Rallifan Private Ltd., Bombay	S.E.	12,000	60,000
M/s. Polar Electric Fan Marking Co., Calcutta.	N.U.	..	14,400

When all the above schemes are implemented the annual rated capacity for electric fans calculated on a single shift basis will increase from 871,750 to 1,645,650 nos. per annum.

Additional capacity required.—From the above figures it will be seen that there is no scope for further licensing in this industry during the Third Plan period in relation to the production target of 2·5 million fans. If subsequently it is found necessary to increase the installed capacity, weightage should be given to the expansion of existing units to the minimum economic size and the establishment of new units in the newly developing and less developed areas. The existing and potential capacity in the small scale sector for the manufacture of fans would also have to be fully utilised.

Investment and employment.—It is estimated that a sum of Rs. 375 lakhs will be invested in the fan industry during the Third Plan period. In estimating this investment it has been assumed that half of the expenditure on schemes under implementation at the end of the Second Plan will spill over in the Third Plan. Additional employment is expected to be generated under this industry for 6,000 persons.

Requirements of raw materials.—The requirements of raw materials for a production target of 2·5 million numbers are estimated to be as follows:

Pig iron & castings	25,000 tons.
Electrical steel sheets	33,200 tons.
Winding wires including resistance wires	3,550 tons.
Mild steel sheets, plates, rods and pipes	11,170 tons.
Bare copper strips and wires and other non-ferrous materials such as brass sheets, wires etc.	*3,750 tons.
Aluminium ingots and sheets	*3,420 tons.
Insulating materials	292 tons.
Varnishes, paints and thinners	568,350 gallons.
Ball bearings	3,750,000 Nos.
Oil retaining bearings	2,125,000 Nos.
Condensers	*1,875,000 Nos.

*These figures are however likely to undergo change in view of the increasing trend towards the use of die-cast bodies and die-cast components as a result of which the requirements of aluminium would increase and those of copper would decrease. The extent of such variations cannot at present be forecast. Similarly since the AC fans are now being made with condensors, the requirement of condensers is also likely to be higher.

The following table summarises the development of electric fans industry in Third Plan :

('000 nos.)

	1960-61	1965-66
Annual capacity (on double shift)	1,744	2,800
Production	1,058	2,500
Internal demand	884	2,250
Exports	96	250

37. ELECTRIC HOUSE SERVICE METERS

The essentials for successful manufacture of electricity meters are knowledge of design and of the most modern materials and techniques in use. The manufacturers of meters abroad have achieved a leading position from experience in these directions accumulated over many decades. In India this industry is hardly 10 years old and has been built on the basis of technical collaborations with the firms abroad specialising in this field. The quality of meters is normally judged by the permanency of accuracy under severe mechanical and electrical stresses.

1. Review of progress in the Second Plan period :

Targets.—A development programme for this industry was not outlined in the Second Plan. Nevertheless, the demand estimate for this item forecast by the Development Council for Light Electric Industries *viz.* 1 million house service meters by 1961 was taken as the background for expansion of capacity in this field.

Capacity and production.—Electric house service meter industry made a beginning in the first plan period. Production was started towards the end of 1951 by M/s United Electrical Industries, Trivandrum. During the Second Plan period additional capacity for 1·34 lakh numbers of house service meters was created in the country. The present installed capacity on single shift basis is given below :

Firm	Installed capacity of single phase meters (nos.)
M/s. United Electrical Industries, Trivendrum	20,000
M/s. Radio and Electrical Manufacturing Co., Bangalore	100,000
M/s. General Electric Co., Calcutta	100,000
M/s. Jaipur Metals and Electricals, Jaipur	120,000
M/s. Malik Electric Works, Bombay	14,000
TOTAL	384,000

The production of house service meters was :

	Lakh numbers
1955	2·55
1956	2·30
1957	3·30
1958	3·48
1959	3·76
1960	4·80
1960-61	5·05

The price of an indigenous single phase meter is Rs. 45, of which 80% is the indigenous content. Items like magnets, bearings and some special materials and alloys are still imported.

The qualitative requirements of single phase and poly phase meters are guided by Indian Standard Specification No. 722 part I and II respectively.

Import and export.—The value of import of house service meters is given below year-wise:

	(Rs. lakhs)
1957	136
1958	74
1959	59
1960	65

As yet there has been no export of the indigenously manufactured house service meters.

At the instance of the Engineering Export Promotion Council, an export target of 40,000 number meters has been fixed by the Development Council for 1961. The indigenous manufacturers have been requested to endeavour to export a minimum of 10% of their individual production in the coming years of the Third Plan period.

II. Programme of Development in the Third Plan:

Estimated requirements.—Based on production and imports, the availability of electric meters in 1960-61 was placed at about 550,000 numbers. At this level of supply, it is felt that there was a shortage of about 10% and making allowance for this, the effective demand should be placed at about 6 lakh numbers. The Development Council for Light Electrical Industries estimated the internal requirements in 1965-66 at 1·5 million single phase and 0·5 million poly phase house service meters. When this estimate was made the annual phasing of growth of electricity was different from the pattern that has finally emerged under the Third Plan. Making allowance for this factor and making a provision of 10% for export requirements, the over-all demand for 1965-66 has been placed at 2·1 million numbers—2 million numbers for single phase and 0·1 million numbers for poly phase.

Capacity and production targets.—The following production targets have accordingly been envisaged for 1965-66 :

Single phase meters	2 million nos.
Poly phase meters	0·1 million nos.

The capacity target for 1965-66 has been fixed at 2·5 million numbers.

New schemes under implementation.—By the end of the Second Plan a number of schemes designed to increase the capacity of the industry had

been licensed under the Industries (Development and Regulation) Act. The details of the schemes approved, which are in varying stages of implementation are given below:

Firm	Licensed capacity for single phase meters (nos.)	Licensed capacity for poly phase meters (nos.)
M/s. Radio and Electrical Manufacturing Co., Bangalore	100,000	48,000
M/s. United Electrical Industries Ltd., Trivendrum	75,000	2,000
M/s. C.R.E. Wood, New Delhi	30,000	..
M/s. Seshasayee Brothers, Madras	60,000	20,000
M/s. Bihar Instrument Manufacturing Co., Patna	60,000	..
M/s. Das Hitachi Ltd., Gaziabad	60,000	6,000
M/s. Electrical Instrument Manufacturing Co., Bombay	60,000	2,400
M/s. General Electric Co., Calcutta	100,000	50,000
M/s. Malik Electrical Works, Bombay	106,000	..
M/s. India Electrical Manufacturing Co., Bombay	60,000	24,000
M/s. Electro Equipment Corporation, Bombay	60,000	..
M/s. Motors and Instrument Private Ltd., Chandigarh	60,000	48 000
M/s. Baroda Electric Meters, Baroda	60,000	24,000
M/s. C. C. Desai, Baroda	60,000	..
M/s. Jaipur Metal and Electrical Ltd., Jaipur	200,000	..
M/s. Sen Raleigh Industries Ltd., Calcutta	60,000	..
M/s. Hindustan Investment Corporation Ltd., Calcutta	60,000	..
M/s. Electric Construction and Equipment Co., Vizagapatam	60,000	18,000
M/s. Assam State Electricity Board, Shillong	120,000	18,000
M/s. D. S. Mahadevia, Bombay	120,000	..
M/s. Beegee Corporation, Patiala	60,000	24,000
TOTAL	1,630,000	284,400

With the implementation of the schemes mentioned above, the rated capacity of the industry on single shift basis is expected to increase to 2·3 million numbers of house service meters on single shift basis. Taken on double shift basis, the total capacity installed and licensed will more than amply meet the envisaged target even if some of the schemes do not materialise. No view has yet been taken so far by the Development Council on the optimum manufacturing unit for Electric House Service Meter industry. A unit with a manufacturing capacity of 60,000 single phase meters on single shift basis and involving an overall investment of about Rs. 25 lakhs is, however, considered to be the minimum unit suitable for the industry from all general considerations and while licensing new units this factor has been kept in view.

Requirements of raw materials.—Due to the wide variations in designs and different practices of using raw materials, it is rather difficult to make

an accurate estimate of the requirements of raw materials. A rough estimate of requirements of principal raw materials for the production target of 2·1 million numbers of meters is given below:

Steel including electric steel sheets	1,500 tons.
Non-ferrous metals like aluminium, brass, aluminium alloys etc.	1,500 tons.
Magnets	22 lakh numbers.
Copper	190 tons.
Insulating materials	300 tons.

With the expansion of this industry, efforts are being made to indigenously manufacture practically all the components required for the production. For the permanent magnets which have so far been imported, licences have already been granted to 5 firms. Of these 5 firms, one firm—M/s. Permanent Magnet, Bombay has concluded arrangements for foreign collaboration. It is expected that the indigenous content of the House Service Meters will exceed 95% by 1965-66.

The following table summarises the development of the House Service Meters industry envisaged during the Third Plan period:

(million nos.)

	1960-61	1965-66
Annual capacity	0·38	2·5
Annual production	0·51	2.1

38. ELECTRIC LAMPS

1. Review of Progress in the Second Plan:

Targets.—At the time of the formulation of the Second Five Year Plan, it was envisaged that the demand of G.L.S. and other similar lamps, would rise to 50·0 million lamps per annum by 1960-61.

The demand for fluorescent tubes and miniature bulbs was expected to rise to 2·0 million and 30·0 million numbers per annum respectively by 1960-61.

To achieve production corresponding to the above levels of demand, capacity of the same order was recommended.

Capacity—(i) *G.L.S. and other similar lamps.*—At the beginning of the Second Five Year Plan, there were eleven units engaged in the manufacture of G.L.S. type of lamps with an annual capacity of 35·95 million lamps per annum. In some of the units there were variations in the capacity claimed by the entrepreneures and that assessed by the Development Wing. It was therefore decided by the Development Council for Light Electrical Industries that the capacity of the industry should be re-assessed. The annual capacity, as reassessed, was as follows:

G.L.S. lamps	36.5 million nos.
Other similar lamps	6.63 million nos.

During the period of the Second Plan one new unit *viz.*, M/s. Hindustan Lamps and Flourescent Tubes Ltd., Calcutta with a capacity of 0·48 million nos. went into production and substantial expansion of capacity was effected in two existing units with a capacity of 4·0 million nos. At the end of 1960-61, there were thus 12 units engaged in the manufacture of G.L.S. and other similar lamps and the installed capacity of these units was 47·61 million nos.

(ii) *Fluorescent tubes.*—At the beginning of the Second Plan, there was only one unit *viz.*, M/s. Electric Lamps Manufacturers (India) Ltd., Calcutta, engaged in the production of fluorescent tubes with an annual capacity of 0·8 million tubes. Since then one new unit *viz.* M/s. Pradip Lamp Works, Patna with a capacity of 0·2 million tubes has gone into production and the capacity of the existing unit has been expanded to 1·0 million tubes per annum. At the end of 1960-61, there were thus two units in the field of fluorescent tubes with an annual installed capacity of 1·2 million tubes.

Details of the schemes which were completed during the Second Plan period are given below :

(million nos.)

Name of the Unit	Nature of the Scheme	Annual capacity as on 1-4-56	Annual capacity as on 31-4-61	Increase in capacity
M/s. Pradip Lamp Works, Patna .	N.A.	..	0·2	0·2
M/s. Electric Lamps Mfg. (India) Ltd., Calcutta	**	0·8	1·0	0·2

**The expansion in the capacity has been achieved by increasing the efficiency of the existing plant and equipment.

(iii) *Miniature bulbs.*—At the beginning of the Second Five Year Plan, there were five units engaged in the manufacture of miniature bulbs with an annual capacity of 11·2 million miniature bulbs. During the Second Plan period, five new units went into production and substantial expansion of capacity was effected in two existing units, giving altogether an additional capacity of 15·65 million bulbs. The capacity of one of the new units has not yet been assessed. At the end of 1960-61, there were thus 10 units engaged in the manufacture of miniature bulbs with an annual capacity of 26·85 million miniature bulbs.

Details of the schemes which were completed during the Second Plan period are given below:

(million nos.)

Name of the Unit	Nature of the scheme	Annual capacity as on 1-4-56	Annual capacity as on 1-4-61	Increase in capacity
M/s Hind Lamps (P) Ltd., Shikohabad	N.U.	..	9·00	9·00
M/s. Miniature Lamp Industries, Dehradun	N.U.	..	1·50	1·50
M/s. Asia Electric Lamp Co., Calcutta	N.U.	..	0·90	0·90
M/s. Auto Lamps, Ltd., Faridabad.	S.E.	0.70	1.15	0.45
M/s. Glass and Miniature Bulbs Works, Kanpur	..	3.00	3.8	0.8
M/s. Electric Lamp Mfg. India Ltd., Calcutta	N.A.	..	3.0	3.0
M/s. Shanker Miniature Bulb Industries, Dehradun	N.A.	..	Capacity not assessed.	

The State-wise distribution of capacity as on 1-4-61 is given below :

(million nos.)

State	No. of units	Capacity as on 1-4-61		
		G.L.S. and other similar Lamps	Flouresecent Tubes	Miniature Bulbs
Maharashtra	3	5·35	Nil	0·60
Bihar	1	3·83	0·20	6·00
West Bengal	7	25·13	1·00	3·90
Punjab	1	Nil	Nil	1·15
Uttar Pradesh	4	9·40	Nil	14·30
Mysore	1	3·90	Nil	0·90
TOTAL	17	47·61	1·20	26·85

Production.—The production of various types of electric lamps in the organised sector since 1955-56 is given below :

(million nos.)

	G. L. S. and other similar Lamps	Fluorescent Tubes	Miniature Bulbs
1955-56	24·23	0·80	2.09
1956-57	31·76	0·94	4.93
1957-58	31·26	0·99	9.61
1958-59	30·14	1·03	12.49
1959-60	34·90	1·17	14.72
1960-61	41·82	1·66	21.05

The production of various types of lamps increased during the period of the Second Plan. Nevertheless, the achievements are short of the Second Plan targets. The production of G.L.S. and other similar lamps and miniature bulbs was well below the targets fixed for these items for the last year of the Second Plan.

In addition to the production of lamps mentioned above, mercury vapour lamps have also been produced by two units *viz.*, M/s. B. Chaudhury & Co., Bombay and M/s. Pradip Lamp Works, Patna. The capacity claimed by each of the units is 30,000 mercury lamps per annum and production of these lamps during 1960-61 was 31,513 Nos. Production of photoflash lamps has also been established by M/s. Pradip Lamp Works, Patna.

Imports.—The imports of all types of lamps since 1957 are given below:

Type of lamps	1957		1958		1959		1960	
	million nos.	value (Rs. lakhs)	million nos.	value (Rs. lakhs)	million nos.	value (Rs. lakhs)	million nos.	value (Rs. lakhs)
G. L. S. and others	0·48	3·83	0·10	0·90	0·008	1·46	0·05	1·3
Electric bulbs for automobiles	0·73	2·67	0·16	0·74	0·10	0·74	0·04	0·4
Bulbs for torches and miniature lamps	13·53	12·29	6·14	5·97	9·00	7·68	10·78	9·17
Fluorescent tubes	0·32	9·33	0·02	1·41	0·003	0·34	0·003	0·31
Other lamps	5·20	36·69	0·97	14·21	0·35	9·72	1·39	14·19

It will be observed that there has been a sharp fall in imports of all types of electric lamps since 1958 which has been made good by the expansion of indigenous production. The imports of fluorescent tubes were negligible during the last year of the Second Plan.

Exports.—The exports of lamps were practically negligible up to 1956. There have been some exports of lamps since 1957. The exports of various types of lamps since 1957 are given below:

(million nos.)

Type of lamps	1957 nos.	1957 value (Rs.)	1958 nos.	1958 value (Rs.)	1959 nos.	1959 value (Rs.)	1960 nos.	1960 value (Rs.)
G.L.S. and others	505	940	31	1,239	76	241	171	
Electric bulbs for automobiles	1,470	1,930	8	85	..	..	..	
Bulbs for torches and miniature lamps	300	33	396	211	24	21	..	..
Fluorescent tubes	1,046	6,830	1,942	12,459	1,885	12,427	29,925	79,059
Other lamps	9,750	16,823	5,463	8,518	1,802	4,342	10,464	6,029

It will thus be seen that the industry has not yet been able to develop an export market except in the case of fluorescent tubes in which case some progress has been made. There are stated to be good prospects of developing exports to Middle East and South East Asian countries.

Consumption.—The approximate number of G.L.S. lamps, fluorescent tubes and miniature bulbs available for meeting the internal requirements during the last six years based on actual production plus imports and minus exports has been as follows:

(million nos.)

	G.L.S. lamps	Fluorecent tubes	Miniature bulbs
1955-56	27·62	1·11	30·70
1956-57	32·04	1·26	30·92
1957-58	31·74	1·31	23·87
1958-59	30·24	1·05	18·79
1959-60	34·98	1·17	23·82
1960-61	41·87	1·66	31·87

In the consumption figures shown above, production of the small scale sector has not been taken into account. There is a large volume of production of miniature bulbs in the small scale sector but accurate information about the production figures is not available.

Capital and labour.—According to the Census of Manufactures, the fixed capital investment in 10 factories out of total of 15 was Rs. 89·0 lakhs in 1957. The labour employed in the industry at the end of 1960-61 was 3,800.

Development Council for Light Electrical Industries.—A Development Council for Light Electrical Industries was set up in early 1955 under the Industries (Development and Regulation) Act. The Council includes the electric lamp industry within its purview.

Quality.—It is stated that adequate testing facilities for G.L.S. lamps, fluorescent tubes, gaseous discharge lamps and miniature lamps inclusive of auto head lights are available in the Government Test House, Alipore and the quality of the indigenous lamps is satisfactory.

II. Programme of Development in the Third Plan:

Estimated Requirements.—With the rising rate of availability of electric power for domestic and commercial purposes, the demand for electric lamps will also be on the increase. The overall industrial development of the country as well as the village uplift/community development schemes and above all, increasing "light consciousness among the people" will result in a more accelerated demand for electric lamps.

Considering the above aspects, it is expected that the internal demand for G.L.S. and other similar lamps would increase by about 10 per cent per annum during the Third Plan period and would rise to about 62 million lamps during 1965-66. An export of about 6 million lamps is also envisaged during the last year of the Third Plan. Thus the total requirements of G.L.S. and other similar lamps is expected to rise to 68 million lamps at the end of the Third Plan period.

Because of longer life and better lighting, fluorescent tubes are fast replacing G.L.S. lamps and their use is increasing in factories, mills, offices, show rooms etc. In view of these factors, it is envisaged that the demand for fluorescent tubes would rise to 6 million tubes which would include about 0·5 million tubes for exports at the end of the Third Plan period.

As regards miniature lamps, it has to be noted that with the progress in rural electrification during the Third Plan period, the demand for torch bulbs may not go up. But this trend is likely to be offset by the growth of population and increase in demand for other varieties, viz., auto, car, cycle dynamo and radio panel lamps. As a guide for planning, the internal demand for miniature bulbs has on balance of all considerations is estimated at about 45 million bulbs during 1965-66. An export of about 5 million bulbs is also envisaged during the last year of the Third Plan. Thus the total requirements of miniature bulbs would rise to 50·0 million Nos. at the end of the Third Plan.

Targets of capacity and production.—For meeting from the indigenous sources the estimated requirements envisaged by 1965-66, an output of 68 million numbers of G.L.S. and other similar lamps, 6 million numbers of fluorescent tubes and 50 million numbers of miniature bulbs is necessary. To achieve this production level of various types of lamps, capacity targets of 76 million for G.L.S. and other similar lamps, 7 million for fluorescent tubes and 55 million for miniature bulbs per annum on double shift basis are envisaged.

Schemes licensed and under implementation.—Licences have been granted up to 31-3-66 for establishing additional capacity of 14·52 million G.L.S. and other similar lamps, 7·12 million fluorescent tubes and 25·35 million

miniature bulbs. Details of the schemes licensed for various types of lamps are given below:

(million nos.)

Name of the scheme	Nature of scheme	G.L.S. and other similar lamps	Fluorescent Tubes	Miniature Bulbs
M/s. Electric Lamp Mfg. (India) Ltd., Calcutta	S.E.	0·25	..	..
M/s. Hind Lamps Ltd., Shikohabad	S.E.	2·50	0·79	..
M/s. Bharat Electrical Industries, Calcutta	S.E.	2·00	1·20	6·00
M/s. Bengal Electric Lamp Works, Calcutta	S.E.	2·00	0·90	3·00
M/s. Bijlee Products (India) (P) Ltd., Bombay	S.E.	0·65	..	..
M/s. Pradip Lamp Works, Patna	S.E.	3·80	0·80	3·00
M/s. Bharat Electric Co. (P) Ltd., Trivandrum	N.U.	0·62	..	..
M/s. Hindustan Lamps and Fluorescent Tubes Ltd., Calcutta	N.U.	..	0·03	2·70
M/s. Tube Supplies (P) Ltd., Madras	N.U.	2·70	..	..
M/s. Lumina Lamps Ltd., Baroda	N.U.	..	1·00	2·50
M/s. R. S. Jhaver, Madras	N.U.	..	1·20	..
M/s. Laximan Industries Ltd., Delhi	N.U.	..	1·20	..
M/s. Auto Lamps Ltd., Faridabad	S.E.	..	..	1·65
M/s. Miniature Lamp Industries, Dehradun	S.E.	..	..	1·50
M/s. Shanker Miniature Works, Dehradun	N.U.	..	..	3·00
	TOTAL	14·52	7·12	23·35

Additional capacity required.—With the implementation of all the schemes mentioned above, there will be 21 units in the electric lamps industry and the capacity for the manufacture of various types of lamps will be as follows on single shift:

G.L.S. and other similar lamps	62·13 million numbers.
Fluorescent Tubes	8·32 million tubes.
Miniature Bulbs	50·20 million bulbs.

The above capacity will be more than enough to produce the estimated requirements of the various types of lamps by the end of the Third Plan. *Prima facie* there does not appear to be any need for creation of new capacity during the Third Plan period. In fact, the targets will not suffer even if all the schemes are not implemented.

Investment and employment.—It is roughly estimated that an investment of Rs. 1·25 crores will require to be made during the Third Plan estimated that the industry will provide employment to about 1,600 persons estimated that the industry will provide employment to about 1,600 persons more.

Requirement of raw materials.—The electric lamp industry is self sufficient to an extent of approximately 60 per cent of its raw material requirements. During the Third Plan period, the industry will continue to depend on imports for some of the raw materials particularly molybdenum wire and fluorescent powder. Certain chemicals, soda lime glass tubing, glass cells, caps, solder wires and tungsten filament are expected to be available from indigenous sources.

The requirements of the principal raw materials for the production targets of 68 million G.L.S. and other types of similar lamps, 6 million fluorescent tubes and 50 million miniature bulbs by 1965-66 will be approximately as follows:

Glass tubing and rod	3,600 tons.
Chemicals	80 tons.
Tungsten wires and coiled filaments	100 million metres.
Molybdenum wires	10 million metres.
Solder Wire	70 tons.
Argon and Nitrogen	4 million cu. ft.
Capping Cement	250 tons.
Leading in wires	215 million pieces.
Brass caps	150 million pieces.
Glass shells	88 million pieces.
Steel Mandrill Wire	4·0 tons.
Hoto Phosphate	35 tons.

The following table summarises the programme of development for the electric lamps industry during the period of the Third Plan:

	(million nos.) 1960-61	1965-66
G.L.S. and other similar types		
Capacity	47·61*	76·00**
Production	41·82	68·00
Fluorescent tubes		
Capacity	1·20*	7·00**
Production	1·66	6·00
Miniature bulbs		
Capacity	26·85*	55·00*
Production	21·05	50·00

*on single shift basis.

**on double shift basis.

39. DRY BATTERIES

I. Review of Progress in the Second Plan:

Targets.—At the time of the formulation of the Second Plan, it was envisaged that the demand for dry batteries would rise to 225 million cells per annum by 1960-61. The capacity of the industry which was 224·5 million cells on single shift was considered to be adequate for the realisation of the production target linked with this demand estimate.

Capacity.—During the Second Plan period, there has been an addition to the installed capacity of the five units engaged in the manufacture of dry batteries.

The State-wise distribution of capacity of the units in operation at the beginning of the Third Plan was as follows :

State	No. of units	Capacity (million cells)
Maharashtra	2	147·5
West Bengal	2	52·0
Madras	1	25·0
TOTAL	5	224·5

Production.—The production of dry batteries since 1955-56 was as under :

	Production (million cells)
1955-56	161·5
1956-57	190·6
1957-58	157·4
1958-59	174·8
1959-60	192·0
1960-61	214·2

It will thus be seen that but for the sudden peak in 1956-57, the production of dry batteries has shown a steady and progressive increase over the 1955-56 level and that the production target has more or less been achieved.

*on single shift basis.

**on double shift basis.

Imports.—The import of dry batteries and parts since 1956, expressed in terms of value, was as given below:

Year	Value (Rs. lakhs)
1956	49·29
1957	28·99
1958	37·70
1959	12·40
1960	

Exports.—Exports of dry batteries were not recorded separately in the Foreign Trade and Navigation Accounts of India upto December, 1956. Since then they are recorded separately in terms of value, as reproduced below.

Year	Value (Rs. lakhs)
1957	9·66
1958	10·44
1959	15·16
1960	

It will be seen that the industry has developed an export market especially in countries like Burma, Afganistan, Nepal, Ceylon, Egypt and Aden.

Consumption.—The demand for dry cells as is evident from the rising levels of indigenous production, has shown a steady increase during the Second Plan period. It is, however, difficult to assess the exact requirements as the import and export statistics are given in terms of value. However, as a rough estimate, the demand during 1960-61 could be placed at about 2150 million cells.

Development Council.—In early 1956, a Development Council for Light Electrical Industries was set up under the Industries (Development and Regulation) Act. The dry battery industry was brought within the purview of this Council. The development programme for this industry during the Third Plan is based on the recommendations of this Council.

Raw materials.—The scheme of M/s. National Carbon Company*, which was licensed in 1954 for the manufacture of 2,000 tons of Zinc Strips per annum was completed during 1956-57. A sum of about Rs. 35·22 lakhs was invested on this scheme. Out of this, Rs. 8·60 lakhs have been invested during the Second Plan period. As regards the use of indigenous manganese ore as a raw material in the manufacture of dry batteries, not much progress has been achieved during the Second Plan period and the reliance on imported ore has had to be continued.

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* Its name is changed to M/s. Union Carbide of India Private Ltd.

II. Programme of Development in the Third Plan:

The Development Council for Light Electrical Industries has recommended a production target of 350 million cells of dry batteries per annum by 1965-66. In visualising the growth of demand to 350 million numbers of dry batteries corresponding to a 60 per cent increase over the 1960-61 level, the Development Council took note of the emphasis placed on the installation of dry-battery operated community radio receivers in rural areas, the effects of increasing urbanisation of these areas and the accent on exports. Considering the above developments, a production target of 350 million cells of dry batteries by 1965-66 seems reasonable.

Targets of Capacity and Production.—To achieve a production level of 350 million cells of dry batteries by 1965-66, a capacity of about 400 million cells has been proposed for establishment on the basis of double shift operation of the production facilities.

Schemes licensed and under implementation.—A licence has been granted to one existing unit *viz.* M/s. Estrela Batteries Ltd., Bombay for effecting substantial expansion from 40 million cells to 65 million cells.

Additional capacity required.—With the implementation of the above scheme, the rated capacity of the industry will increase to 249·5 million cells per annum on single shift. With a few sections being worked on multishifts, it should be possible to achieve the target production of 350 million cells by the end of the Third Five Year Plan, mostly with the existing capacity and with balancing additions to plant and machinery, wherever necessary in certain sections of the various units under operation. In view of this, there does not appear to be any need for the creation of new capacity.

Raw materials.—The principal raw materials required by battery industry are manganese ore, non-ferrous metals like zinc, cadmium and lead, carbon electrodes, acetylene black, graphite, synthetic resin extrusion compounds and industrial adhesives, special paper and boards and miscellaneous small parts as components. Majority of these are imported at present.

It is anticipated that during the Third Plan period, items like synthetic resin extrusion compounds, industrial adhesives, paper boards and miscellaneous parts consumed in volume will all be locally available.

The approximate quantity of the important raw materials required for the production of 350 million cells by 1965-66 are given below:

Zinc strips/slabs	4,665 tons
Brass strips, contacts, caps, etc.	113 ,,
Solder (tin and lead)	152·4 ,,
Manganese ore and activated manganese dioxide .	7,332 ,,

Ammonium Chloride	2,256	tons
Acetylene Black	798	,,
Zinc Chloride	558	,,
Synthetic resins, adhesives, solvents, etc.	2,000	,,
Paper and paper board, corrugated boards and cartoons, etc.	100	,,
Miscellaneous chemicals and materials such as asphalt, resin, parafin wax, gums, etc.	2,000	,,
Graphite	100	,,
Carbon electrodes	240	million nos.

The following table summarises the programme of development of the industry during the Third Plan period :

	1960-61	1965-66
Number of units	5	5
Capacity (million cells)	224·5*	400·0**
Production (million cells)	214·2	350·0

*on single shift basis.

**on double shift basis

40. STORAGE BATTERIES

1. Review of Progress in the Second Plan:

Targets.—At the time of the formulation of the Second Five Year Plan, it was envisaged that the rated capacity of the industry would increase to 350,000 storage batteries by the end of the plan period as against a capacity of 290,100 in 1955-56. The production was expected to reach 350,000 batteries in 1960-61 as against 258,086 in 1955-56.

Capacity.—At the beginning of the Second Five Year Plan there were 13 units engaged in the manufacture of storage batteries with an annual capacity of 290,100 batteries. Since then substantial expansions of capacity accounting for 95,200 batteries have been effected in five existing units. One of the existing units *viz.* M/s. Estrela Batteries Ltd., has stopped the manufacture of storage batteries. At the end of 1960-61 there were thus twelve units engaged in the manufacture of storage batteries with an annual installed capacity of 379,300 batteries as registered with the Development Wing.

Details of the schemes which were completed during the Second Plan period are given below:

Name of the unit	Nature of scheme	Annual capacity as on 1-4-56 (nos.)	Annual capacity as on 1-4-61 (nos.)	Increase in capacity (nos.)
M/s. Associated Battery Makers Ltd., Calcutta	S.E.	100,000	106,600	6,600
M/s. Bharat Battery Mfg. Co. (P) Ltd., Calcutta	S.E.	15,000	46,800	31,800
M/s. Standard Batteries Ltd., Bombay	S.E.	80,000	90,800	10,800
M/s. Himco India Ltd., Bombay	S.E.	7,000	18,000	11,000
M/s. Amco Batteries Ltd., Bangalore	S.E.	15,000	50,000	35,000

The statewise distribution of capacity, as on 1-4-56 and 1-4-61, of the units registered with the Development Wing is given below:

State	Capacity as on 1-4-56		Capacity as on 1-4-61	
	No. of units	Capacity (nos.)	No. of units	Capacity (nos.)
West Bengal	6	160,000	6	198,400
Maharashtra	3	93,000	2	108,800
Mysore	2	18,500	2	53,500
Madras	1	15,000	1	15,000
Delhi	1	3,600	1	3,600
TOTAL	13	290,100	12	379,300

Production.—The production of storage batteries in the organised sector since 1955-56 was as follows:—

	(Nos.)
1955-56	258,086
1956-57	317,730
1957-58	323,190
1958-59	371,486
1959-60	469,423
1960-61	521,203

The storage battery industry has thus made considerable progress during the Second Plan period. The production has shown 101% increase over the 1955-56 level. Both capacity and production have exceeded the Second Plan targets.

Diversification of production.—Considerable progress has been made in respect of diversification of production of storage batteries during the Second Plan period. All types of batteries such as motor cycle batteries and heavy duty batteries required for use in omnibuses, heavy trucks, train lighting cells, miners' cap lamp batteries, stationary batteries, special types of defence batteries etc. are now being manufactured in the country and the internal demand is almost entirely met from indigenous production.

Small scale sector.—The storage battery industry in the Small Scale Sector has made considerable progress during the Second Plan period. The number of manufacturing units increased from 100 with an annual capacity of 125,000 batteries in 1955 to 110 with annual capacity of 345,740 batteries in 1960. As against a production target of 70,000 batteries fixed for 1960-61, production during 1960 was 113,003 batteries.

Imports.—The figures of imports of storage batteries were not separately classified in the Foreign Trade and Navigation Accounts of India uptill December, 1956. These figures are indicated only since January, 1957 onwards. Figures as given since January, 1957 were as follows:

	Quantity (Nos.)	Value (Rs. lakhs)
1957	59,903	55·24
1958	5,508	11·65
1959	3,608	6·78
1960	739	5·28

Exports.—The export of storage batteries since 1957 was as under:

	Quantity (nos.)	Value (Rs. lakhs)
1957	394	0·20
1958	641	0·50
1959	1,656	0·92
1960	16	0·02

It will thus be seen that much success has not been achieved in establishing an export market for this industry. This is due to the fact that storage battery plants have been established in many nearby Asian countries and there has been competition from certain Far East and East European countries in these markets.

Consumption.—Internal demand for storage batteries has shown a steady rise. The internal demand obtained by adding the imports and indigenous production minus exports, has shown a more or less steady increase during the five year period. The position in this regard is indicated below:—

	Production (nos.)	Imports* (nos.)	Exports* (nos.)	Consumption (nos.)
1955-56	258,086	1,713†	..	259,799
1956-57	317,730	3,000†	..	320,730
1957-58	323,190	59,903	394	382,690
1958-59	371,486	5,504	641	376,348
1959-60	469,423	3,608	1,656	471,375
1960-61	521,203	739	16	521,926

*Relates to calendar year.
†Estimated.

The above production figures relate to the organised sector only. The unorganised sector is estimated to have produced 113,003 batteries during 1960 which were also available for consumption. Thus the overall consumption both from large and small scale sectors during 1960 was about 634,929 batteries.

Quality of batteries.—The quality of indigenous storage batteries is satisfactory and there has been improvement year by year. The organised sector of the industry is producing most of the batteries according to the specifications formulated by the Indian Standards Institution.

Investment.—A sum of about Rs. 15·0 lakhs is estimated to have been invested by the large scale manufacturers of storage batteries on plant, machinery, land and buildings during the Second Plan period.

Employment.—About 2,200 workers were employed in the large scale sector of the storage battery industry at the end of the Second Plan as against 1,700 employed at its beginning.

Development Council.—The Government of India constituted a Development Council for Light Electrical Industries in early 1955, under the Industries (Development & Regulation) Act. The storage battery industry comes within the purview of this Council which has formulated recommendations regarding the development of this industry under the Third Plan.

II. Programme of Development in the Third Plan:

Estimated requirements.—The storage batteries are mainly used for automobiles which account for about 90% of total consumption besides being used for radios, train lighting etc. Increase in demand for storage batteries during the Third Plan will be determined mainly by the number of new motor vehicles put on the road. According to the development of automobile industry envisaged during the Third Plan, it is estimated that the number of vehicles on the road using storage batteries will increase from 575,000 in 1960-61 to 1,050,000 in 1965-66.

On an average a battery lasts for 18 months in the case of cars and jeeps and 12 months in other vehicles. Accordingly, the requirements of storage batteries by 1965-66 for motor transportation are estimated at 9 lakhs. In addition, there will be additional demand for storage batteries by railways and shipping, telephone, radio etc. which is estimated at about 1 lakh batteries. Thus the total requirements of the storage batteries by 1965-66 would be of the order of 10 lakh numbers. The Development Council for Light Electrical Industries has recommended a production target of 8 lakh batteries for the organised sector for 1965-66. This leaves a gap of 2 lakh batteries which could be produced in the small scale sector.

Target of capacity and production.—As against an estimated requirement of 10 lakh batteries by 1965-66, a production target of 8 lakh batteries has been fixed for the large scale sector and rest of the 2 lakh batteries are expected to be produced in the small scale sector. To achieve a production level of 8 lakh batteries in the large scale sector by 1965-66 a capacity of 900,000 batteries on double shift has been proposed for establishment. In the small scale sector the existing capacity of 345,740 batteries is sufficient to produce 2 lakh batteries.

Schemes licensed and under implementation.—Licences have been granted for establishing one new unit with a capacity of 8,400 batteries and substantial expansion of three units with a capacity of 147,400 batteries giving altogether an additional capacity of 155,800 batteries.

Details of the schemes are given below:

Name of the Unit	Nature of the scheme	Capacity at the end of 1960-61 (nos.)	Additional capacity licensed (nos.)	Annual capacity when the schemes are implemented (nos.)
M/s. Automobile Battery Ltd., Bombay	N.U.	..	8,400	8,400
M/s. Bharat Battery Makers (Eastern) Pt. Ltd., Calcutta	S.E.	46,800	69,000	115,800
M/s. Amco Batteries Ltd., Bangalore	S.E.	50,000	70,000	120,000
M/s. Mysore Electro-Chemical Ltd., Bangalore	S.E.	3,500	8,400	11,900

Additional capacity required.—With the implementation of all the schemes mentioned above, the rated capacity of the industry is expected to increase from 379,300 to 535,100 batteries per annum on single shift. By working this capacity on multiple shift, a production level of 800,000 batteries can be achieved by the end of the Third Plan period. On this basis, there is no need to license any more capacity in the coming years vis-a-vis the estimated demand for the Third Plan.

Investment and employment.—A sum of about Rs. 15·0 lakhs is likely to be invested in this industry during the Third Plan period.

Since no major new units are expected to come in the storage battery industry during the Third Plan period, there will not be much increase in the employment potentialities in this industry. As the existing units are expected to work on double shift, the employment under this industry may rise from about 2,200 workers to about 2,800 workers by 1965-66.

Requirements of raw materials.—The principal raw materials required by the storage battery industry are lead, antimony, sulphur, rubber (natural and reclaimed), synthetic resins and separators. The requirements of sulphur and synthetic resins are wholly met by imports while lead, rubber and separators are partly imported. By 1965-66, the industry is expected to be self sufficient in case of separators, rubber etc. Some items like sulphur, lead and certain chemicals may have to be imported even at the end of the Third Plan.

The requirements of the principal raw materials for the production of 1,000,000 storage batteries by 1965-66 is given below:

Lead	15,000 tons.
Antimony	1,000 ,,
Lead Oxide	2,500 ,,
Alkali-reclaimed rubber	3,000 ,,
Rubber components for containers & plugs	250 ,,
Sulphur	525 ,,
Wooden separators	30 million numbers.
Other types of separators	30 million numbers.

The following table summarises the development of the storage battery industry envisaged under the Third Plan:

	1960-61	1965-66
Organised Sector		
No. of units	12	13
Capacity (nos.)	379,300†	900,000††
Production (nos.)	521,203	800,000
Decentralised Sector :		
Capacity (nos.)	345,740*	345,740
Production (nos.)	118,000*	200,000

*Relates to calendar year 1960.

†on single shift basis.

††on double shift basis.

41. RADIO RECEIVERS

I. Review of Progress in the Second Plan:

Targets.—At the beginning of the Second Plan, the rated capacity of the organised units engaged in assembling radio receivers was of the order of 213,000 numbers per annum. Leaving some room for expansion of the industry in the small scale sector, the then existing capacity of 213,000 numbers per year in the large-scale sector was considered to be adequate to meet the requirements of radio receivers by 1960-61 estimated at 200,000 to 225,000. This target was, however, revised upwards to 300,000 numbers in the appraisal of the Plan carried out in 1958.

Capacity.—There were 15 units engaged in the assembly of radio receivers on the active list of the Development Wing in April 1956. Their installed capacity, as mentioned above, was assessed at 213,000 sets per annum. Currently, the organised sector of this industry has an annual installed capacity of the order of 279,180 radio receivers distributed among 20 units. The State-wise distribution of this installed capacity at the beginning and the end of the Second Plan is indicated below:

State	No. of Units	Installed capacity as on 1-4-1956	No. of Units	Installed capacity as on 1-4-1961
Maharashtra	5	91,200	7	139,200
Bihar	1	12,000	1	12,000
Delhi	1	6,000	1	6,000
Madras	1	3,000	2	6,000
Mysore	1	18,000	1	18,000
Punjab	1	4,800	1	4,800
West Bengal	5	76,800	5	89,200
TOTAL	15	211,800*	20	279,180

*Exclusive of the capacity for 1,200 amplifiers of M/s. Flash Lights India Ltd., Calcutta which was also included in the capacity figures assessed at 213,000 in 1955-56.

The main centres of concentration of the industry are Bombay and Calcutta in so far as production of radio receivers is concerned. There is considerable activity in Delhi particularly in the field of manufacture of radio components and hardware and also the production of radio receivers

in the small scale sector. It will be observed that additional capacity of the order of 67,380 numbers was installed during the period under reference. The scheme-wise details of the installation of this additional capacity are indicated in Annexure I.

Production.—The restrictive import policy and the subsequent ban on imports of radio receivers have given a fillip to the development of the indigenous industry. The production of radio receivers increased from 1·02 lakhs in 1955-56 to 2·8 lakhs in 1960-61 as given below:

	Production (Nos.)
1955-56	102,000
1956-57	156,740
1957-58	194,880
1958-59	196,909
1959-60	226,552
1960-61	280,123

It will be seen that the production has more than doubled during this quinquinnium and has almost reached the revised target for the Second Plan.

A recent development which is worth mentioning is the production of cheap radio receivers priced at about Rs. 125 per set. It is expected that the industry will be producing about 50,000 cheap radio receivers during 1961.

In the small scale sector, according to a survey conducted by the Office of the Development Commissioner (Small Scale Industries), there were in 1958, 188 units with a total annual installed capacity of 63,000 radio receivers and components worth Rs. 75 lakhs. The production recorded in that year was only 35,000 radio receivers and components of the value of Rs. 26 lakhs which obviously indicates that there was considerable under-utilisation of the installed capacity. The inadequate supply of imported raw materials and components is stated to be the main reason for this under-utilization of capacity. As regards production of radio receivers and components in the later years of the Second Plan period, no precise data are available. The capacity and production of radio receivers in 1960-61 have however been estimated by the Development Commissioner (Small Scale Industries) at 65,000 and 40,000 numbers respectively. Taking into account this estimated production of 40,000 sets in the small scale sector, the overall production of radio receivers in the last year of the Second Plan may be placed at about 3·2 lakhs.

Manufacture of components.—With regard to the manufacture of components of radio receivers, considerable progress has been made during the Second Plan period. At present all the hardware and metallic parts and

fittings, transformers, coils, cabinets, dials, knobs, etc., are being manufactured in the country and a beginning has also been made in the manufacture of some of the essential components such as paper capacitors, carbon resistors, wave band switches, ceramic capacitors, loud speakers, potentiometers and gang condensers.

The progress recorded in the production of these essential components during the Second Plan period was as indicated below :

('000 numbers)

Radio components	1956	1957	1958	1959	1960
Loud speakers	62·2	80·8	65·2	121·5	186·3
Band change switches	..	5·8	28·9	169·3	304·1
Potentiometers	101·8	190·2	101·1	115·1	194·9
Gang condensers	49·5	48·4	38·7	67·7	101·6
Carbon resistors	..	1,075·0	1,282·11	2,184·9	3,285·5
Paper capacitors	..	..	138·9	1,493·6	1,726·8
Ceramic capacitors	287·5*	247·5*	722·2*	2,226·6	3,337·0

*Figure relates to the fiscal year.

Apart from the increasing volume of production of the above components during the Second Plan period, a development which deserves special mention is the commencement of production of valves by the Bharat Electronics Ltd. It is expected that by 1962-63 the firm would be in full production upto its installed capacity of 1·8 million valves per annum.

Imports and exports.—Import of radio receivers below 9 valves was completely banned even before the beginning of the Second Five Year Plan. Small quota licences for about 7% to 5% were being allowed for import of radio receivers of 9 valves and above. Even this import was totally banned from October, 1957-March, 1958 licensing period.

The statistics of the value of radio receivers and components imported during the past few years are given below:

(Rs. lakhs)

	1957	1958	1959	1960
Complete radio receivers (Domestic)	5·7	2·0	16·1	14·9
Complete radio receivers (N.E.S.)	2·3	1·7	5·7	3·4
Loud speakers	14·0	11·4	12·7	22·3
Radio receiving tubes	45·3	33·4	36·4	41·4
Other parts	142·0	121·5	103·4	115·6

As regards exports, not much progress was made during the Second Plan period. In 1960, however, radio receivers valued at about Rs. 85,000 were exported to West Asian countries. Further, there were exports worth about Rs. 25,000 in the first five months of 1961.

Manufacture of transistorised radio receivers.—The transistorised sets are gaining popularity and their manufacture has recently been taken up by some of the existing radio manufacturers. The production figures for 1960 and the first half of 1961 were 9,091 and 8,491 respectively.

Consumption.—As against the estimate of 300,000 radio receivers by 1960-61, the actual offtake in the year was about 3·2 lakhs This was arrived at on the basis of taking into account the actual production in the organized sector, imports and exports and also the estimated production in the small scale sector.

Capital and labour.—In view of the fact that some of the units manufacturing radio receivers are also manufacturing a variety of other items, it is difficult to make an accurate assessment of the total investment made in this industry during the Second Plan period.

The number of persons employed in the organised sector of the industry at present is placed at 5,600.

Ancillary developments.—In order that matters relating to different groups of industries coming within the purview of the Development Council for Light Electrical Industries could be studied more closely, the Council formed four panels which included one for radio receivers, amplifiers, electronic equipment, telephones and telegraphic equipment.

The Development Council also formed an Export Promotion Sub-Committee in order to study the export possibility in the industries coming within the purview of the Council.

Quality and standards.—The Indian Standards Institution has prescribed specifications for radio receivers as well as their componets. The quality of the indigenous products is generally reported to be satisfactory.

II. Programme of Development in the Third Plan:

Estimated requirements.—The demand for radio receivers is influenced by various factors such as the price, increase in *per capita* income, credit policy adopted by entrepreneurs in connection with the sale of radios, progress in electrification, extension of broadcast coverage and the programme regarding installation of community radio receiver sets and possibilities of export. Taking these factors into account, it is considered that in the next five years the demand might increase to about 850,000 to 900,000 radio sets.

Schemes under implementation.—The industry's capacity for assembling radios in 1960-61 was about 2·8 lakhs. Further, a few schemes with a total additional capacity of about 0·6 lakhs have also been licensed in the Second

Plan period and were in varying stages of implementation at the start of the Third Plan. The foreign exchange required for these schemes is comparatively small. The details of these schemes are indicated in Annexure II. It will be seen that the availability of assembling capacity on the basis of existing facilities and the additional capacity licensed so far would be about 3·4 lakhs on single shift. Viewed against the double shift target capacity of 9 lakh radio receivers, the gap left in assembling capacity would be about 1·5 lakhs on single shift which would have to be covered by further licensing. This would, however, have to be linked with the manufacturing programmes of components if the strain by way of imports on maintenance account is to be minimised.

Keeping in view the target of production of radio receivers, steps have already been taken for the large-scale manufacture of components. The total capacity for essential radio components licensed upto the end of March 1961 is indicated item-wise in Annexure III.

As the achievement of self-sufficiency in components is one of the prerequisites for the rapid development of the radio receivers industry and the attainment of the targets envisaged, necessary assistance and encouragement would have to be given to the components manufacturing programmes.

Target of capacity and production.—A capacity of the order of 9 lakh radio receivers on double shift basis is considered adequate to achieve a production of 8 lakhs of sets suggested as the target for the organised sector of this industry in 1965-66.

The gap between the production target for the organised sector and the estimated demand would be of the order of 50,000 to 100,000 sets in the last year of the Third Plan. It is expected that production in the small-scale would develop and cover this gap.

The following table summarises the development programme of the radio receivers industry:

	Unit	1960-61	1965-66	
Annual capacity	Nos.	279,180	900,000	(double shift).
Production				
(*a*) Organised sector . . .	Do.	280,123	800,000	
(*b*) Small-scale sector . . .	Do.	40,000	50,000 to 100,000	

ANNEXURE I

Additional capacity installed during the Second Plan for the manufacture of radio receivers.

Name of the Scheme	Location	N.U./S.E.	Additional capacity installed (Numbers)
M/s Murphy Radio.	Bombay	S E.	12,000
M/s Phillips (India) Ltd.	Poona	N.U.	12,000
M/s Telerad, Bombay	Bombay	N.U.	24,000
M/s I.R.P. Radio	Calcutta	For carrying on the business	400
M/s Phillips	Calcutta	S.E.	12,000
M/s S.P. Gramaphone Co.	Jullunder	For carrying on the business	3,600
M/s Singhson Radio Co.	Faridabad	For carrying on the business	380
M/s G. Janshi & Co.	Madras	For carrying on the business	3,000
		TOTAL	67,380

ANNEXURE II

Additional capacity for radio receivers licensed up to the end of March 1961

Name of the scheme	N.U./S.E.	Annual capacity (Numbers)
M/s I.R.P. Radio, Calcutta	S.E.	9,600
M/s G.E.C., Calcutta*	S.E.	10,000
M/s Gramaphone Co., Calcutta	S.E.	12,000
M/s Western Agencies, Bombay	S.E.	12,000
M/s Mulchandani Electrical and Radio Industries, Bombay*	S.E.	7,800
M/s Eastern Electronics, Faridabad*	S.E.	4,800
M/s Singhson Radio, Delhi*	S.E.	520
M/s Electronics India, Madras	S.E.	425
	TOTAL	57,145

*These schemes which are under implementation have made considerable progress.

ANNEXURE III

Components for radio receivers

Components	Capacity licensed up to March 1961 (including existing capacity) (million numbers)
Valves	1·80
Transistors and diodes	0·50
Loud speakers	2·85
Paper cones for loud speakers	0·66
Gang condensers	1·40
Potentiometers	4·80
Band change switches	1·15
Carbon resistors	35·18
Paper capacitors	20·91
Mica capacitors	53·50
Electrolytic capacitors	12·71
Ceramaic capacitors	33·80
Capacitors (other specials such as styraflex, polyster)	5·84
Trimming capacitors.	17·65

CHEMICALS AND ALLIED INDUSTRIES

42. FERTILIZERS

A. Nitrogenous Fertilizers

1. Review of Progress in the Second Plan :

Target.—The Second Plan envisaged the expansion of capacity for nitrogenous fertilisers from 85,000 tons of nitrogen in 1955-56 to 382,000 tons in 1960-61 and the production from 76,000 tons of nitrogen in 1955-56 to 290,000 tons in 1960-61.

Capacity and production.—The increase in the capacity and production was expected to be achieved by the expansion of the Sindri Fertiliser Factory and M/s. Fertilisers and Chemicals, Travancore (FACT) and the establishment of new fertiliser factories at Nangal, Neyveli and Rourkela. It was also expected that additional quantities of ammonium sulphate would be obtained as by-product at the steel plants and that ammonium chloride would be produced by M/s. Sahu Chemicals in conjunction with the production of soda ash.

Expansion of Sindri Fertiliser Factory.—The expansion scheme of Sindri envisaged the production of urea (capacity 11,000 tons of nitrogen annually) and ammonium sulphate/nitrate or double salt (capacity 36,000 tons of nitrogen annually). This scheme for the implementation of which technical assistanee was provided by M/s. Monteecatini of Italy was completed in 1959 as against the end of 1957 set as the target date. Even so, no extra output was achieved at Sindri in the remainder of the Plan period for several reasons such as the low performance of the lean gas plant, shortage of coal of suitable quality, lack of spare parts as well as the caking characteristics and acidic nature of the double salt produced. The gross fixed investment of Rs. 13 crores incurred on the Sindri expansion scheme in the Second Plan period was financed from internal resources to the extent of Rs. 4 crores.

Expansion of FACT.—This expansion scheme envisaged the production of 20,000 tons of additional nitrogen in the form of ammonium sulphate and ammonium phosphate, and ammonium chloride. There has been a delay of 18 to 24 months in the completion of the project as compared to the original date set for production *viz.*, the end of 1958. The first stage of the expansion programme for a capacity of 10,000 tons of nitrogen has been completed in 1961. The second stage of expansion necessitating installation of an oil gasification plant is expected to be completed by the middle of 1962 when another 10,000 tons of nitrogen would be added to the capacity of the factory. When this expansion is achieved the high cost wood gasification operation for synthesis gases is proposed to be discontinued. The expansion scheme was financed up to about Rs. 1 crore from the loan assistance given by the Industrial Finance Corporation of India.

M/s. Sahu Chemicals, Varanasi.—This scheme for the production of 10,000 tons of nitrogen as ammonium chloride (and 40,000 tons of soda ash)

was completed by the end of 1959 but, because of technical difficulties, no significant production was achieved during the rest of the plan period. It is hoped that the rated production will be achieved by the middle of 1962. Financial assistance for this project was provided by a direct loan of Rs. 1·5 crores by the Uttar Pradesh Government.

Nangal Fertiliser Factory.—Production of calcium ammonium nitrate (20·5% nitrogen content) equivalent to 80,000 tons of nitrogen was envisaged at this factory. The construction schedule was delayed by a year owing to the foreign exchange crisis of 1957 and the consequent need to negotiate deferred payment arrangements for plant and machinery. The plant was brought into partial production (1/3 capacity) in February, 1961. Full production is expected to be reached by middle of 1962.

Rourkela and Neyveli Fertiliser Projects.—The Rourkela factory was scheduled to produce 80,000 tons of nitrogen as calcium ammonium nitrate (20·5% nitrogen content). It has, however been designed for a capacity of 120,000 tons of nitrogen per year but the higher level of production is to be realised when additional coke oven gas supplies are available from the expansion of the Rourkela steel works. The Neyveli fertiliser project was originally planned for urea and sulphate-nitrate, but later this was changed to manufacture only urea (equivalent to 70,000 tons of Nitrogen per annum) by the complete recycle process. The completion of both the factories has been delayed mainly owing to foreign exchange difficulties. It is now expected that the Rourkela fertiliser factory will be in production in 1962-63 and Neyveli in 1963-64.

The total installed capacity of nitrogenous fertiliser factories at present is as under:

Sindri	117,000	tons of nitrogen.
FACT	20,000	„ „ „
Mysore	1,300	„ „ „
By-product ammonium sulphate	13,360	„ „ „
Sahu Chemicals	10,000	„ „ „
Nangal	80,000	„ „ „
TOTAL	241,660	„ „ „

The year-wise production of nitrogenous fertlisers and the capacity at the beginning of each year are given below :

(tons of nitrogen)

	Capacity	Production	
1956-57	86,300	77,508	(85,000)
1957-58	86,300	76,482	(102,000)
1958-59	86,300	78,797	(140,000)
1959-60	86,300	72,748	(175,000)
1960-61	158,300	97,150	(290,000)

The figures in brakets represent the production targets envisaged in the Second Plan. The lag in production as compared to the targets visualised in 1956 gave rise to large deficits in the availability of nitrogenous fertilisers and added to the strain on maintenance account. The imports of nitrogenous fertilisers in the Second Plan period were as follows :

Q—Quantity in '000 tons.
V—Value in Rs. lakhs.

Year	Ammonium Sulphate		Urea		Ammonium Sulphate/ nitrate		Calcium ammonium nitrate		Total
	Q	V	Q	V	Q	V	Q	V	V
1956-57 . .	230·0	644·9	9·9	63·4	14·3	61·7	2·0	6·8	776·8
1957-58 . .	341·6	1,049·1	59·3	369·0	29·9	116·4	22·1	55·6	1,587·8
1958-59 . .	160·0	369·4	88·0	468·0	67·2	213·5	32·5	80·2	1,131·1
1959-60* . .	376·0	773·0	99·8	387·0	75·0	205·0	76·0	162·0	1,588·4
1960-61† . .	356·7	751·0	55·9	255·1	19·5	45·3	75·0	158·7	1,213·5

*Other imports included nitrophosphate 10,000 tons valued at Rs. 35 lakhs and ammonium phosphate 10,700 tons valued at Rs. 26·4 lakhs.

†1,000 tons of nitrophosphate valued at Rs. 3·4 lakhs was also imported.

Price.—The retention price of ammonium sulphate produced at Sindri at the beginning of the Second Plan was Rs. 270 per ton while the pool price was Rs. 315 per ton f.o.r. railhead destination. In 1957, the retention price was raised to Rs. 280 while the pool price was raised to Rs. 350 per ton. In 1958, the retention price was further raised to Rs. 290 per ton while the pool price remained at Rs. 350 per ton. In 1959, the Tariff Commission went into the question of fixation of fair retention price for ammonium sulphate produced by Sindri Fertilizers and Chemicals Ltd. and submitted a report in which the retention price payable to Sindri from the Fertilizer Pool for the future was recommended at Rs. 300 per ton upto 31st March 1962.

Investment and employment.—The total investment in the nitrogenous fertilizer industry during the Second Plan period has been of the order of Rs. 47 crores of which the foreign exchange component was about Rs. 17·5 crores. The public sector outlay out of this investment was Rs. 44 crores. The total number of persons employed in this industry is about 16,000.

Forward planning with reference to Third Plan.—In chapter of the 'Programmes of Industrial Development 1956-61" reference was made to a proposal from M/s. Burmah Shell Refineries for the establishment of a fertiliser plant with an annual capacity of 50,000 tons fixed nitrogen on the basis of refinery gases at Trombay. No progress was made on this proposal and in 1958 an Ad Hoc Committee was appointed by Government to formulate proposals for setting up a plant at this promising location. Based on the recommendation of this Committee, a decision was taken in 1959 in favour

of a public sector unit at Trombay designed to produce urea and the complex fertiliser, nitrophosphate, with a total capacity of 90,000 tons of nitrogen. Against the background of the fertiliser shortage which began to be felt actually by the middle of the Second Plan, Government set up the Fertiliser Technical Committee in March 1959 to formulate preliminary project reports with reference to specific sites in the States of Madhya Pradesh, Rajasthan, Assam, Andhra Pradesh, Mysore and Uttar Pradesh many of which had been examined in 1954 by an earlier Technical Committee. Attention was directed to forward planning with a view to achieving a mid-plan target of 750,000 tons of nitrogen as a matter of high priority. Clearance was given in the last year of the Second Plan for going ahead with fertiliser projects at Kothagudam in Andhra Pradesh, Durgapur in West Bengal, Naharkatiya in Assam, Hanumangarh in Rajasthan, Gorakhpur in U.P., Vizagapatnam in Andhra Pradesh and at a suitable site in M.P. against the background of an overall demand of one million tons of nitrogen. To facilitate planning of the appropriate quantities and types of fertilisers at the various locations, the overall estimate of demand has been broken up region-wise and product-wise after taking into account all relevant considerations.

II. Programme of Development in the Third Plan:

Estimated requirements.—It has been envisaged that the total requirements of nitrogenous fertilisers in the country would be met if fertilisers equivalent to 1 million tons of nitrogen were available by 1965-66. The major targets in the agricultural sector for the Third Plan to which the demand estimates of 1 million tons of nitrogen, 400,000 tons of P_2O_5 and 200,000 tons of K_2O have been related are, foodgrains, 100 million tons; oilseeds 9·8 million tons; sugarcanes 100 million tons; cotton, 7·0 million bales; and jute 6·2 million bales. In order to attain the million ton target for nitrogen, the following pattern of production of end-products has been tentatively visualised :

End-product	1965-66 '000 tons of nitrogen
Ammonium sulphate	230
Ammonium sulphate/nitrate	30
Nitro-limestone	160
Nitrophosphate	40
Urea	280
Ammonium phosphate	240
Ammonium chloride	20
TOTAL	1,000

It will be seen from the above that a significant portion of the additional output of nitrogen is being planned in the form of compound and/or complex fertilisers so that a part of the phosphate requirements will also be met simultaneously. The ammonium phosphate is planned for production on

the basis of wet process making use of sulphuric acid from imported sulphur and indigenous pyrites. The tight situation relating to availability and cost of power in the country under the Third Plan and the comparatively easy supply position of sulphur are factors which weighed against the adoption of the electro-thermal process for phosphoric acid and phosphatic fertilisers and for the swing in favour of the 'wet process'.

Allocation of nitrogen capacity between public and private sectors.—Fertiliser industry falls under Schedule B of the Industrial Policy Resolution of April 1956. As regards priority under the Third Plan, it is ranked on par with iron and steel which was given the 'core' status in the Second Plan. At the time of the publication of the draft outline of the Third Plan (May, 1960) it was envisaged that the capacity for nitrogenous fertilizers in the public sector would be 800,000 tons of nitrogen and that the balance of 200,000 tons required to reach the target of 1 million tons would be developed in the private sector. It now seems probable that the private sector will undertake rather more than previously contemplated and that the capacity in the public sector by 1965-66 will be somewhat less than 800,000 tons. The schemes so far approved for implementation and major details relating to them are briefly outlined below.

Public Sector Projects.—In addition to the completion of fertiliser projects carried over from the Second Plan, it is proposed that further capacity for nitrogenous fertilisers should be established in the public sector by both the Central Government and some of the State Governments. The pattern of financial arrangements for the schemes of the State Government is still to be negotiated and settled. The paragraphs below deal with projects which are wholly in the public sector, under the Central and State Governments.

Trombay Fertiliser Project.—The factory is planned for utilising refinery gases and naphtha and would have a capacity of about 90,000 tons of nitrogen. The pattern of production would be that half of the available ammonia would be converted into urea by a partial recycle process and the balance of ammonia would be utilised for the manufacture of nitrophosphate by nitric acid treatment of rock phosphate. The phosphate content of the complex fertiliser would be rendered partially water soluble by the use of sulphuric acid.

Assam Fertiliser Project.—The factory would be set up at Namrup in Assam based on "associated gas" available from the Naharkatiya oil fields. The overall capacity of the plant as scheduled at present is for 32,500 tons of nitrogen based on the production of 50,000 tons of urea and 50,000 tons of ammonium sulphate by the acid neutralisation process, the acid being produced from imported sulphur. A special feature of this factory is that it will include a gas-fired steam power plant.

Gorakhpur Fertiliser Project.—The capacity of the factory would be 80,000 tons of nitrogen per annum and the end-product would be

urea produced by the total recycle process. The raw material for this factory would be petroleum naphtha from the refinery at Barauni which is at a distance of 200 miles from the fertiliser plant.

Expansion of FACT and other schemes.—Apart from the central public sector projects mentioned above, there is the scheme for further expansion of M/s. Fertilisers & Chemicals, Travancore by 30,000 tons of nitrogen, to produce ammonium sulphate/ammonium phosphate and ammonium chloride. Additional production of by-product ammonium sulphate may also be expected in connection with the expansion schemes of the steel plants. It is also envisaged that one more public sector nitrogenous fertiliser factory with a capacity of about 80,000 tons of nitrogen will be implemented during the Third Plan period.

Private Sector Schemes.—The scheme of M/s. Parry & Co. for the manufacture of ammonium phosphate equivalent to 8,250 tons of nitrogen is under implementation at Ennore near Madras. Doubling of the ammonium chloride-*cum*-soda ash plant of M/s. Sahu Chemicals, Varanasi has been approved in principle and would add another 10,000 tons of nitrogen to its productive capacity. Other major projects that have been licensed are :—

Kothagudium Fertiliser Project.—A nitrogenous fertiliser factory based on coal from Singerani colleries was originally intended to be taken up by the Andhra Pradesh State Govt. This has subsequently been transferred to the private sector and is to have a capacity equivalent to 80,000 tons of nitrogen in the form of urea. This project is to be executed by M/s. Andhra Sugars Ltd. jointly with M/s. Sheshasayee Bros.

Vishakhapatnam Fertiliser Project.—M/s. Parry & Co,. have been licensed to set up the factory in financial and technical collaboration with M/s. California Chemical Co. and M/s. International Minerals and Chemicals Corporation Co. of the U.S.A. It is proposed to produce under this project about 80,000 tons of fixed nitrogen per year in the form of 365,000 tons of ammonium phosphates of various grades in terms of 20-22-0 and 16,500 tons of prilled urea. The raw material for this factory would be naphtha.

Madhya Pradesh Fertiliser Project.—This factory is to be set up by M/s. Khandelwal Bros. at Itarsi or any other location in M.P. to be settled in consultation with Government and would have capacity to manufacture 101,300 tons of urea per year (equivalent to 50,000 tons of nitrogen), by the total recycle process. Coal from Madhya Pradesh or Naphtha from petroleum refineries would be the feed-stock depending on further examination of the relevant economic factors.

Rajasthan Fertiliser Project.—Shri B. L. Jalan has been licensed to set up a factory with an annual capacity of 80,000 tons of nitrogen with

ammonium sulphate as the end product. Gypsum supplies of the State would be utilised for the sulphate manufacture. Alternative feedstock for ammonia synthesis including lignite from Palana are under consideration.

Other Projects.—In addition to the above-mentioned schemes private enterprise in partnership with the West Bengal Government is expected to put up a fertiliser factory at Durgapur with a capacity of 58,000 tons of nitrogen. The Govt. of Gujerat also propose to set up a factory with a capacity of 96,000 tons of nitrogen in collaboration with the private sector. A final view on the exact capacity of this plant and the agency for its implementation is yet to be taken.

Other locations considered suitable for building up nitrogen plants are Mangalore in Mysore State, Tuticorin in Madras State and the Koyna area in Maharashtra State.

Taking all relevant factors into consideration, the position in regard to nitrogenous fertilisers in the Third Plan is currently visualised as follows :

(Quantity in '000 tons of Nitrogen)

	Total requirement	Installed capacity	Indigenous production
1961-62	400	242	140
1962-63	525	300	200
1963-64	650	400	300
1964-65	800	600	500
1965-66	1,000	1,000	800

It is estimated that for the realisation of a capacity of 1·0 million tons of nitrogen and 400,000 tons of P_2O_5, an investment of Rs. 230·0 crores of which the foreign exchange element will be about Rs. 105·0 crores would have to be incurred in the Third Plan period. Further build-up of capacity to overcome the deficits in the initial years of the Fourth Plan as well as to augment the indigenous supplies even during the later year of the Third Plan period over the levels indicated above would be welcomed in this high priority field.

Petroleum feedstocks (natural and refinery gases and naphtha) and coke-oven gases will loom large in the future years as raw materials for ammonia synthesis under this industry. The investments required for coal/lignite-based plants are rated at about 15 per cent higher as compared to units designed to operate the other feedstocks. Even so, coal based plants situated close to coal deposits would have a place under this industry in locations far removed from sources of supply of the alternative feedstocks, but commanding a compact local market for the fertiliser produced.

Summarised statement of the development programme for nitrogenous fertilisers under the Third Five Year Plan

Project	State in which located	Expected year of completion	Additional capacity in terms of nitrogen (tons)	End product ('000 tons)	Feedstock for ammonia synthesis	Estimated Investment (Rs. crores)		Remarks
						Over all	Foreign Exchange	
1	2	3	4	5	6	7	8	9
				(a) Public Sector				
Rourkela	Orissa	1963-64	120,000	Nitro-chalk—600	Coke Oven gas.	18	N.A.	Scheme spilling over from Second Plan.
Neyveli	Madras	1963-64	70,000	Urea-155	Lignite	16	11·6	Ditto.
Trombay	Maharashtra	1964-65	90,000	Urea-100 and nitro-phosphate 225.	Refinery gas and liquid petroleum feed-stock.	25	13	
Namrup (Naharkatiya).	Assam	1964-65	32,500	Urea-50 and ammonium Sulphate-50.	Associated gas	12	7	
FACT (2nd stage Expansion).	Kerala	1961-62	10,000	Ammonium Sulphate-165 and ammonium phosphate 132. Ammonium Chloride 24·5.	Naphtha	8	5·6	
FACT (3rd stage expansion).	Kerala	1964-65	30,000					
Gorakhpur	Uttar Pradesh	1965-66	80,000	Urea-180	Naphtha	18	8	

By-product of steel plants.	..	1965-66	10,000	Ammonium sulphate-50.	Fixation of ammonium sulphate in Coke Oven gas.	N.A.*	N.A.*	*Investment would be included under the steel plants.
				(b) Private Sector				
Itarsi/Katni or other suitable site.	Madhya Pradesh	1964-65	50,000	Urea-101·3 . .	Coal . .	17	8	Scheme of M/s. Khandelwal Bros.
Hanumangarh	Rajasthan .	1964-65	80,000	Ammonium Sulphate-347·2.	Coal or lignite or naphtha or natural gas.	25	12	Scheme of Shri B. L. Jalan.
Kothagudium .	Andhra Pradesh	1964-65	80,000	Urea-190 . . .	Coal . .	24	11	Scheme of M/s. Andhra Sugars & Sheshasayee Bros.
Vishakhapatnam	Andhra Pradesh	1964-65	80,000	Ammonium Phosphate-365 prilled Urea-16.	Naphtha .	20	12	Scheme of M/s. Parry & Co. IMCC/California Chemicals Co.
Durgapur . .	West Bengal .	1965-66	58,000	Urea-N.A. Nitro-phosphate-N.A.	Coke Oven gas	20	8	In collaboration with Govt. of West Bengal.
Sahu Chemicals, Varansi.	Uttar Pradesh .	1965-66	10,000	Ammonium chloride-40.	Coal . .	3·5	1·5	Will also produce Soda ash.
Parry & Co. Ennore.	Madras . .	1962-63	8,250	Ammonium Phosphate-50.	Naphtha . .	3	1·5	
				(c) Under consideration				
Gujarat . .	Gujarat . .	Not definite at this stage.	96,000	Am. Sulph-350 . . Am. Phos-150.	Naphtha .			
Mysore . .	Mysore . .	..	70,000	Urea-82·5 Am.Phos. 132·5	Naphtha .	22	10	

B. PHOSPHATIC FERTILISERS

1. Review of Progress in the Second Plan :

Target.—It was envisaged under the Second Plan that the capacity of the phosphatic fertiliser industry would rise from 35,000 tons to 120,000 tons of P_2O_5 and the production from 20,000 tons to 120,000 tons of P_2O_5. It was expected that the target would be achieved by the production of 83,300 tons of P_2O_5 as single superphosphate, 3,700 tons of P_2O_5 as ammonium phosphate and the balance as triple superphosphate and dicalcium phosphate.

Capacity and production.—The increase in the capacity of the phosphatic fertiliser industry in India was achieved almost entirely by the expansion of the manufacture of single superphosphate. Part of the scheme of M/s. Fertilisers and Chemicals, Travancore for the manufacture of amonium phosphate was delayed and is expected to materialise in full by middle of 1962. The progress of the superphosphate industry is shown below :

(Figures in tons of single superphosphate)

	Capacity		Production	
1956	255,824	(44,300)	81,170	(13,530)
1957	277,584	(46,260)	141,678	(73,610)
1958	310,572	(51,760)	166,846	(27,810)
1959	330,672	(55,110)	247,426	(41,270)
1960	343,668	(57,280)	318,191	(53,030)

Figures in Bracke's indicate equivalent quantity in terms of P_2O_5.

No scheme for the manufacture of triple superphosphate or dicalcium phosphate materialised during the Second Plan period.

The manufacture of single superphosphate continued to be based on imported raw materials, rock phosphate and sulphur. The import of sulphur has been accounted for under sulphuric acid. The following are the quantities and value of imported rock phosphate during the Second Plan period :

	Quantity ('000 tons)	Value (Rs. crores)
1957	115·0	1·55
1958	121·3	1·13
1959	185·9	1·70
1960	236·2	2·07

It would be seen from the above that c.i.f. price of rock phosphate has come down considerably since 1957.

Although the production of single superphosphate has increased sharply the production in 1960 being four times that of 1956 the capacity and production achieved are well behind the targets set for the Second Plan. The main reason for this shortfall is said to be lack of demand commensurate with the expectations formed in 1956. Since for maintaining soil fertility, it is necessary to use phosphatic fertiliser along with nitrogenous fertilisers, the Fertiliser Distribution Enquiry Committee appointed by the Ministry of Food and Agriculture in 1959 has recommended certain measures for popularising the use of phosphatic fertilisers. Among important measures suggested are (i) the grant of a subsidy of 25% on all purchases of superphosphate to be borne by the Central Fertiliser Pool. The existing position about concessional price for superphosphate is that a subsidy of 25% is admissible if the State Government bears 50% of the expenditure entailed on this account, (ii) encouraging superphosphate manufacturers to build up sales organisations and develop sales by providing incentives. The manufacturers may also take the help of co-operative societies for popularising the use of phosphatic fertilisers. These suggestions are receiving the attention of the industry as well as Government.

The total estimated investment in the phosphatic fertilisers industry (excluding sulphuric acid and complex nitrogen-phosphorus fertilisers) during the Second Plan was Rs. 2·1 crores of which the foreign exchange component is about Rs. 30 lakhs. This industry employed about 1,800 persons.

II. Programme of Development in the Third Plan:

Estimated requirements.—If phosphates are not used while applying nitrogenous fertilisers, there is a rapid drain of the mineral content of the soil. This is why application of nitrogenous fertilisers requires the corresponding application of phosphatic fertilisers also. During the Second Plan period N: P_2O_5 ratio was envisaged at 3 : 1. During the Third Plan period this is proposed to be further adjusted, in keeping with the trends in advanced western countries where the ratio is 1:1. Since the offtake of nitrogenous fertilisers is visualised as 1 million tons of nitrogen in 1965-66 and the N : P_2O_5 ratio is proposed to be envisaged as approximately 2:1, the capacity and production targets for phosphatic fertilisers have been kept at 400—500 thousand tons of P_2O_5. The Ministry of Food and Agriculture have arrived at a similar figure on an assessment of likely demand of phosphatic fertilisers in different states by 1965-66.

Among the end-products of P_2O_5 proposed for manufacture during the Third Plan are single superphosphate, ammonium phosphate, nitrophosphate and dicalcium phosphate. The various points in favour of and against these end-products are discussed below :

Superphosphate.—About half of the production of phosphatic fertilisers in India is likely to be in the form of single superphosphate. This fertiliser has the advantage of having the entire phosphate content in water soluble form so that it could be applied profitably to any soil in India. Further, superphosphate could be ammoniated and the ammoniated product would have both nitrogen and phosphorus in a single fertiliser.

Triple Super.—While triple superphosphate has all the advantages of single superphospate, it has the added advantage of having nearly three times the phosphate content of single superphosphate of equivalent weight. This concentration makes triple superphosphate easier to handle and there is also some saving in the bagging and transportation of this fertiliser. It has, however, been felt that larger scale production of triple superphosphate in India may not be justified for the following reasons :—

(a) Machinery for manufacture of single superphosphate is mostly indigenously produced whereas equipment for manufacture of triple superphosphate would have to be almost entirely imported, and the foreign exchange requirement in the latter case would be much higher.

(b) In view of the higher cost of production, and because of the larger initial capital investment of a triple superphosphate manufacturing unit, the freight advantage in the case of the concentrated fertiliser will only be felt when transportation has to be made over long distances of say 1,000 miles. In about 2 to 3 years time when the new factories licensed for single superphosphate commence production, there will be more than thirty producers distributed throughout the country and the movement of the fertilisers from a factory to its consumer may not generally exceed 150 miles.

It is, therefore, felt that creation of new capacity for triple superphosphate would not be justified unless (i) such production is based on a process utilising hydrochloric acid instead of the usual sulphuric acid or (ii) its production is undertaken along with production of nitrogenous fertilisers on a large scale.

Nitrophosphate.—This fertiliser is prepared by treating rock phosphate with nitric acid instead of sulphuric acid used in the manufacture of superphosphate. Since the country is dependent on imported sulphur for manufcture of sulphuric acid, the production of nitrophosphate is *prima facie* desirable. The phosphate produced by the reaction of rock phosphate and nitric acid is citrate soluble and not water soluble. The general view held by agronomists is that citrate soluble phosphates can be used profitably in acidic soils, but they are not so readily available to plants in neutral or alkaline soils. Therefore, nitrophosphate produced by ordinary methods would have to be suitably treated in order to convert at least part of the phosphate into the water soluble form so that the product could be used with benefit in all types of soils. It has been suggested by the Fertiliser delegation which studied the situation and practices in Europe that the nitrophosphate, produced could be treated with sulphuric acid for rendering the part of the phosphate water soluble. Thus some sulphur would be required even in the manufactureof nitrophosphate, although the requirement would be less than the amount of sulphur required for the manufacture of an equivalent quantity of superphosphate.

Ammonium Phosphate.—Ammonium phosphate is a very popular fertiliser because it is completely water soluble and therefore applicable to all types of soils besides it also supplies nitrogen at the same time. The

only difficulty in its manufacture is the requirement of sulphur, when phosphoric acid is manufactured by the wet process. However, sulphur could be used very profitably if joint production of ammonium phosphate and ammonium sulphate is undertaken. The attractive feature of such joint production is that the sulphur is used twice, firstly in the form of sulphuric acid for producing phosphoric acid which goes to the production of ammonium phosphate and secondly in the form of the calcium sulphate precipitated during the manufacture of phosphoric acid which can be utilised for the manufacture of ammonium sulphate. This process is to be adopted by FACT in its expansion scheme and a wider adoption of this process during the Third Plan would be desirable.

Dicalcium Phosphate.—Manufacture of dicalcium phosphate was considered desirable because hydrochloric acid is used in its manufacture instead of sulphuric acid. The manufacture of dicalciumphosphate with hydrochloric acid has three advantages :

(1) it could serve as an outlet for chlorine of electrolytic caustic soda plants,

(2) it obviates the necessity of using sulphur, and

(3) dicalcium phosphate has a higher phosphate content than single superphosphate. The difficulty in its use is that the phosphate in this fertiliser is only citrate soluble and therefore it could be used with advantage only in acidic and neutral soils.

Others.—Apart from the phosphatic fertilisers discussed above, ground rock phosphate and bone meal are also being used as source of phosphorus depending on soil conditions. It is estimated that about 10,000 tons of P_2O_5 as bone meal and 20,000 tons of P_2O_5 as ground rock phosphate would be used towards the end of the Third Plan.

The total capacity for phosphatic fertilisers licensed so far amounts to about 344,000 tons of P_2O_5. This includes the nitrophosphate schemes of Trombay, the ammonium phosphate schemes of FACT and Vizagapatnam and the schemes for dicalcium phosphates in addition to the existing and licensed units for single superphosphate. Adding to this 30,000 tons of P_2O_5 on account of bone meal and ground rock phosphate, the total comes to 374,000 tons of P_2O_5. The balance of the target capacity may be expected to be achieved by complex fertilisers *e.g.*, nitrophosphate and ammonium phosphate in the new nitrogenous fertiliser factories whose details are yet to be finalised.

It is understood that a complex fertiliser is being developed (Potassic Phosphate) in a foreign country in which both potassium and phosphorus are present. It is also learnt that their pilot plant trials have succeeded in the production of triple super-phosphate by using hydrochloric acid instead of sulphuric acid. A scheme has been licensed for a capacity of 5,000 tons of triple super based on hydrochloric acid to be established near Bombay as an integral part of a caustic soda-*cum*-organic chemicals plant.

Raw materials.—The major requirements of raw materials for this industry are rock phosphate and sulphur. Sulphur requirement for this industry

has already been indicated under sulphuric acid. For production of 400,000 tons of P_2O_5, rock phosphate requirement would be 1·4 million tons valued at Rs. 12·6 crores at the present c.i.f. price of Rs. 90 per ton.

Investment and labour.—The total investment required for achieving the target production is estimated to be about Rs. 10 crores. This estimate excludes the requirement for sulphuric acid and complex nitrogenous-*cum*-phosphatic fertilisers which have been separately taken into account. Foreign exchange requirements are expected to be small since superphosphate plants are being manufactured within the country. The additional employment created by the achievement of this target would be for about 4,000 persons (excluding sulphuric acid and complex nitrogenous fertilisers).

C. Potassic Fertilisers

Little systematic attempt has been made to develop the manufacture of potassic fertilisers in India. The indigenous production is in the small scale sector and the annual total is estimated to be around 2,000 tons as muriate of potash. Thus practically all the requirement of potassic fertilisers are met by imports. The following are the details of imports of potassic fertilisers during the last few years :

Q=Quantity in tons.
V=Value in Rs. lakhs.

	1957		1958		1959		1960	
	Q	V	Q	V	Q	V	Q	V
Muriate of potash	18,337	58·00	25,038	65·58	52,544	131·84	22,530	58·39
Sulphate of Potash	13,972	37·87	2,961	10·12	10,062	32·74	8,630	25·52

Three companies have been granted licenses for the manufacture of muriate of potash from saltbitterns for a capacity of about 3,000 tons per annum but practically no progress has been made by them. The total availability in 1959 amounted to about 36,000 tons of K_2O which exceeded the originally estimated requirement of 30,000 tons of K_2O by 1960-61.

Third Plan requirements :

The Ministry of Food and Agriculture have estimated that the demand for potassic fertilisers would be 200,000 tons of K_2O by 1965-66. From present trends it appears that the requirement would have to be met mainly by imports. However, from present production of sea salt it is theoretically possible to recover about 40,000 tons of muriate of potash. In actual practice, recovery of about 20,000 tons of potassium chloride from sea salt bitterns may be feasible. Even for this output special efforts would have to be made to organise collection and processing of the mother liquor left over after crystallisation and removal of common salt. The S. T. C. is supporting experiments for the recovery of potassium chloride from salt bitterns at Tuticorin.

In the absence of major expansion of indigenous production the value of imports may reach about Rs. 10 crores annually towards the end of the Third Plan if the requirement of potassic fertilisers as now forecast has to be met in full.

43. HEAVY INORGANIC CHEMICALS

A. Sulphuric Acid

I. Review of Progress in the Second Plan:

Targets.—The Second Plan envisaged expansion of the sulphuric acid industry to a capacity of 500,000 tons per year and fixed the production target at 470,000 tons for 1960-61.

Capacity and production.—At the beginning of the Second Plan the annual rated capacity of 39 units producing sulphuric acid was 253,888 tons expressed in terms of 100% acid and based on 330 working days in a year. The corresponding figure at the end of the Second Plan was 525.884 tons. During the Second Plan period 7 small plants have gone out of production and 11 new plants have come into existence. The installed capacity of some of the old units has been re-assessed leading to some increase in their capacity over the former level. The balance of the increase in capacity has been achieved through new units and substantial expansions of existing units. The region-wise distribution of the capacity at the end of the Second Plan as compared with that at the beginning is as under :

Name of the State	No. of units	Capacity as in 1956 (tons)	No. of units	Capacity as in 1961 (tons)
Assam	1	6,600	1	6,600
Bihar	6	46,101	7	48,840
Gujerat & Maharashtra	12	56,492	12	96,053
Delhi	3	11,220	1	24,750
Punjab	3	3,554	1	3,300
Andhra Pradesh	1	2,970	3	35,970
Madhya Pradesh	2	10,230	2	31,350
Madras	1	18,150	2	44,550
Mysore	1	8,250	1	8,250
Kerala	1	44,220	3	137,220
Uttar Pradesh	3	6,105	4	14,355
West Bengal	5	39,996	6	74,646
Total	39	253,888	43	525,884

The names of new units and of plants which have expanded between 1956 and 1961 together with their capacities and the year in which the installations were completed are given below :

Year of completion	Name of unit	Capacity (tons)	New Unit or expansion
1956-57	Nil	..	..
1957-58	M/s Shaw Wallace & Co.	8,250	New
	M/s D.C.M. Chemical Works, Delhi	14,850	Exp.
	M/s Century Rayons	7,140	New
1958-59	Bihar Govt. Superphosphate Factory	8,250	New
	Fertiliser & Chemicals Travancore Ltd.	60,000	Exp.
1959-60	M/s Dharamsi Morarji Chemical Co.	16,500	Exp.
	M/s Shaw Wallace & Co.	16,500	Exp.
	Hindustan Steel Ltd., Bhilai	19,800	New
	M/s J.K. Cotton Spinning & Weaving Mills	8,250	New
1960-61	Hindustan Steel Ltd., Durgapur	19,800	New
	M/s Atul Products Ltd., Bulsar	8,250	New
	M/s Indian Explosives Ltd., Gomia	3,300	New
	M/s Kesoram Rayons, Calcutta	8,250	New
	M/s Anil Starch Products Ltd., Ahmedabad	9,000	Exp.
	M/s Andhra Sugars Ltd., Tanuku	16,500	New

The distribution of the plants capacity-wise shows the following pattern :

Units with a daily capacity of	No. of units	Aggregate annual capacity in 1961 (tons)
Less than 10 tons	6	8,168
From 10 tons to less than 25 tons	14	48,200
From 25 tons to less than 50 tons	11	125,046
50 tons and above	12	344,470
TOTAL	43	525,884

Whereas the aggregate capacity of units with a daily capacity of 25 tons and above represented 62% of the total sulphuric acid capacity in the country in 1956, this had increased to over 88% in 1961, and the aggregate capacity of units with a daily capacity of 50 tons and above constituted about 64% of the total. This trend is in accordance with the recommendation made at the beginning of the Second Plan that the capacity of plants should be raised to the minimum economic level.

The share of the public sector in this industry which represented about 17% of the total capacity in the country in 1956 has increased to about 29% in 1961 as can be seen below :

	Capacity in the public sector (tons)	Capacity in the private sector (tons)
1956	44,220	209,668
1961	152,070	373,814

The total annual installed capacity at the beginning of each year and the yearly production of sulphuric acid during the Second Plan period were as under :—

(Figures in tons)

Year	Capacity	Production
1956	253,888	165,215
1957	281,816	196,062
1958	350,064	226,588
1959	435,120	292,169
1960	463,920	353,943

Consumption.—As against the estimated requirements of 470,000 tons of acid in 1960-61 forecast in 1956, the actual consumption during the last year of the Second Plan is placed at 360,000 tons. The lower offtake is mainly a consequence of the shortfall in superphosphate production *vis-a-vis* the target set for it. The industrywise distribution of the offtake in 1960-61 is estimated to have been as follows :

	Consumption of sulphuric acid in 1960-61 (tons)
Ammonium Sulphate	70,000
Superphosphate	140,000
Pickling of finished steel	26,000
Rayon Yarn & Staple fibre	59,000
Aluminium Sulphate and other inorganic acids and salts	24,000
Petroleum refining	8,000
Industrial explosives	3,000
Miscellaneous	30,000
TOTAL	360,000

Availability and consumption of raw material and other aspects.—Although the production of sulphuric acid from gypsum, pyrites and sulphur obtained from coal came up for discussion from time to time, the entire production in the country is at present based on imported sulphur. It is estimated that in 1960-61 about 126,000 tons of sulphur were used for the manufacture of sulphuric acid. The c.i.f. price of imported sulphur, which was about Rs. 285 per ton in 1957, has come down sharply in the last few years and was about Rs. 165 per ton in 1960-61. The supply position of sulphur has also eased considerably.

The ceiling price of sulphuric acid is being fixed according to the following formula : the price of sulphuric acid should not exceed Rs. 175 per ton ex-works in ton lots related to a price of Rs. 275 per ton of sulphur as received in the sulphuric acid works. For every Rs. 5 increase or decrease in the price of sulphur, the corresponding variation in the price of acid will be Rs. 2 per ton. This scheme is working satisfactorily.

On an average, about 80% of the installed capacity of the sulphuric acid industry in the country was utilised. Utilisation of capacity would have been better if through the provision of an adequate number of mild steel tank wagons, there were suitable and full arrangements for the transportation of acid. Production in some of the units was curtailed because of the difficulty and cost of transporting the acid to the consuming centres.

Plant equipment.—The fabrication of sulphuric acid plants is being undertaken within the country. Three units have been licensed for the manufacture of complete sulphuric acid plants in the capacity range of 50 tons per day. The are :—

M/s D. C. M. Chemical Works, Delhi

M/s K. C. P. Ltd., Madras

M/s Larsen & Toubro, Bombay

Manufacturers of sulphuric acid have been advised to arrange for indigenous fabrication of plants. At present, except for specialised items like sulphur pumps, catalyst and instruments, imports are not generally permitted.

Investment and employment.—The total investment in this industry during 1956-61 is estimated to have been about Rs. 3·2 crores of which the foreign exchange component was Rs. 1·2 crores. The share of the public sector in the estimated investment was about Rs. 1·3 crores. The total number of persons employed in this industry at the end of the Second Plan was about 2,000.

II. Programme of Development in the Third Plan :

Estimated requirements.—The overall demand for sulphuric acid is expected to go up to about 1·5 million tons by 1965-66 representing an increase of 325% over the level which obtained in 1960-61. Fertilisers will

account for about 1,090,000 tons out of this total as will be seen from the industry-wise break-up given below :

Consumer Industry	Estimated consumption of sulphuric acid in 1965-66 (In thousand tons)
Superphosphate and Ammonium phosphate	890
Ammonium sulphate and nitrophosphate	200
Pickling of finished steel	30
Rayon Yarn and Staple fibre	135
Aluminium sulphate	40
Petroleum refining	16
Titanium di-oxide	24
Miscellaneous (including bichromates, phosphoric acid, alum, hydrochloric acid, nitric acid, magnesium sulphate, copper sulphate, ferrous sulphate, industrial explosives, dyestuffs, drugs and others)	165
TOTAL	1,500

New capacity licensed and under implementation.—The total capacity of schemes licensed for implementation and spilling over into the Third Plan is estimated at 875,000 tons. This augmentation comes wholly though captive plants in the fertiliser, rayon and staple fibre, steel, mineral oils as well as dyestuff intermediates & synthetic drugs industries. Having regard to the wide dispersal of these industries visualised under the Third Plan, surplus acid from these captive plants is expected to be available in different parts of the country for meeting the demands of relatively smaller industrial consumers *e.g.* batteries, distilleries for alcohol, etc.

Additional capacity for sulphuric acid in the public sector is expected to be planned in captive plants as outlined below :

(a) Manufacture of 100% acid and oleum in the basic chemicals and intermediates plant near Panvel, Maharashtra State.

(b) Sulphuric acid and chlorosulphonic acid in the synthetic drugs plants at Sanatnagar, Andhra Pradesh.

(c) Sulphuric acid at the Barauni Refinery.

(d) Expansion of capacity for sulphuric acid as part of the Bhilai and Durgapur Steel expansion programmes, a new unit under the Bokaro Steel Project, and expansion of capacity at the Bihar Superphophate factory.

(e) Sulphuric acid under the Assam Fertilizer Project, FACT expansion and the Trombay Fertilizer plant since decision has been taken to produce there the complex fertiliser with 50% water solubility.

In connection with future expansion of capacity, it is proposed to ensure utilization of pyrites for the production of sulphuric acid to the extent of at least 20% of the total consumption of equivalent sulphur. This will be possible as deposits of pyrites to the extent of over 68 million tons have been proved at Amjhor. As regards minimising the consumption of sulphuric acid in the fertilizer field, whereas. on the one hand, the scope has been lessened by the decision that totally citrate soluble phosphatic fertilizers are not acceptable, there are encouraging signs that some headway could be made if the process for the manufacture of phosphoric acid from hydrochloric acid is developed on commercial scale plants. The need for developing this process is not very urgent, however, in view of the likely greater use of indigenous pyrites for the production of sulphuric acid.

Target for the Third Plan.—Taking all factors into consideration, the capacity target for sulphuric acid by 1965-66 is visualised at 1·75 million tons and production of 1·5 million tons. Some of these plants will also be capable of producing oleum and chlorosulphonic acid, the demand for which is expected to develop in conjunction with manufacture of organic intermediates and synthetic drugs.

Requirements of Sulphur.—As against 160,000 tons of sulphur estimated in 1956 as the requirement for acid manufacture in 1960-61, the actual offtake is now placed at 126,000 tons. Assuming indigenous availability of pyrites in terms of sulphur equivalent at 42,000 tons and reckoning the output of by-product sulphuric acid from smelter gases at 25,000 tons, the additional demand for sulphur in 1965-66 *vis-a-vis* the production target is envisaged at nearly 460,000 tons. The industry-wise demand for elemental sulphur is expected to conform broadly to the following pattern :

('000 tons)

	1960-61	1965-66
For sulphuric acid manufacture	126	460
For Carbon disulphide	15	35
For Sugar Industry	15	26
Miscellaneous demand	20	31
TOTAL	176	552

Estimate of investment and employment.—It is estimated that the investment required for increasing the capacity to 1·75 million tons would be about Rs. 8·4 crores, of which the foreign exchange component would be Rs. 1·98 crores. The additional employment resulting from the enlarged capacity wound be for 4,000 persons.

The following table summarises the programme of development of the sulphuric acid industry during the Third Plan :

	1960-61 (tons)	1965-66 (tons)
Annual capacity	526,000	1,750,000
Production	354,000	1,500,000

B. Soda Ash

I. Review of Progress in the Second Plan :

Targets.—The Second Plan envisaged expansion of the soda ash industry from an installed capacity of 90,000 tons in 1955-56 to 253,000 tons by 1960-61. The target for actual production was 230,000 tons. Part of the targetted production was expected to be processed further into caustic soda and thus soda ash for sale from indigenous sources was placed at 185,000 tons. Soda ash plants were aiso expected to instal equipment for converting a part of their production into heavy ash.

Capacity and production.—Expansion of soda ash production was envisaged in 1956 at the Mithapur plant of Tata Chemicals and at 3 new units to be established at Porbander, Tuticorin and Dalmianagar (*vide* page 194 of Volume of Programmes of Industrial Development 1956-61). Subsequently the expansion of the Mithapur plant was dove-tailed into a bigger scheme calculated to raise the capacity of the works to 400 tons per day. By the end of 1960 expansion of capacity upto 300 tons per day had been achieved under this scheme. The construction of the soda ash plant at Porbander was completed in 1959 and production trials started in 1960. Rated production has been achieved in June, 1961. Its progress towards achieving full production was arrested by an explosion in the limekiln department. The Dalmianagar Project which was finally located near Varanasi and adopted the modified soda ash process went into production at the end of 1959 but the unit is running considerably below its rated capacity due to unexpected delays and technical difficulties in co-ordinating peak production in all departments. At Tuticorin soda ash production was envisaged on the basis of the carbonation of caustic soda but this part of the project is not likely to be taken up and as the caustic soda unit has so far been installed with only half the licensed capacity of 160 tons per day and the balance is to be implemented in 1962.

The overall capacity of the soda ash plants in operation at the end of the Second Plan is rated at 268,000 tons per year—M/s. Tata Chemicals, 108,000 tons; M/s. Dhrangadhra Chemicals, 54,000 tons; M/s. Saurashtra

Chemicals, 66,000 tons; and M/s. Sahu Chemicals, Varanasi, 40,000 tons. As compared to the levels of production envisaged during the Second Plan the actuals were as given in the table below:

Production and Imports of Soda Ash

(Figures in '000 tons)

Year	Estimated output in the Plan	Actual* Production	Imports* Quantity	Imports* Value (Rs. crores)
1956-57	85	84	91	2·01
1957-58	90	92	85	2·16
1958-59	120	89	51	1·07
1959-60	175	94	127	2·37
1960-61	230	145†	109†	1·95

*For Calendar Years. †Metric Tonnes.

The lag in production was due to delays in the installation of new capacity and teething troubles in the post-commissioning state. There has also been no production of dense soda ash, a major raw material of the glass industry. In the circumstances, subtantial imports had to be made to meet the domestic requirements. The break-up of requirements for 1960-61 currently envisaged as compared to plan estimates were as under :

Break-up of requirements of Soda Ash in 1960-61

(Figures in '000 tons)

Consumer Industry	As envisaged in the Plan	Latest Estimate
Caustic Soda	45	11
Sodium bi-carbonate	6	8
Sodium silicate	18	24
Bichromates	6	6
Glass and bangles	70	70
Paper and pulp	4·5	7
Textile	7	10
Laundries, Dhobies and miscellaneous	72	104
TOTAL	228·5	240

Protection and price.—The Tariff Commission went into the question of the continuance of protection to the soda ash industry and submitted its report in 1958. The following are the main recommendations in the report :

1. Protection to the industry should continue for three years *i.e.* till 31st December, 1961 and the existing rate of protective duty (*i.e.* Rs. 5-10 annas per cwt., standard and Rs. 4-3 annas per cwt. preferential) should remain in force.
2. Government should take necessary steps at an early date to establish capacity for the manufacture of superior highgrade coke.
3. The railway administration should undertake an examination of the question relating to open wagon movement of salt after taking into account the steps adopted in other countries for the purpose.
4. Arrangements should be made to import light soda ash to the extent of about 37,000 tons in 1958 and heavy soda ash to the extent of about 48,000 tons in 1958, 44,000 tons in 1959 and 7,000 tons in 1960. Apart from ensuring the importation of these quantities effort should be made to regulate their arrival and supply in an even manner.

Government accepted recommendation No. 1 and have taken steps to implement it. Government have also taken note of recommendations 2 to 4 and steps will be taken to implement them as far as possible.

Capital investment and employment.—It is estimated that the total investment in the soda ash industry during the Second Plan period will have been about Rs. 17 crores of which the foreign exchange component was about Rs. 9 crores. The total employment in this industry is about 3,800 persons.

II. Programme of Development in the Third Plan :

Estimated requirements.—The break-up of demand for soda ash has been estimated to be as follows at the end of the Third Plan.

Industry	Estimated consumption requirements in 1965-66 (In thousand tons)
Chemical Caustic Soda	50
Sodium bi-carbonate	15
Glass & Bangles	140
Sodium silicate	35
Textiles	15
Paper	20
Bichromates	10
Dhobies and Laundries	135
Miscellaneous	30
TOTAL	450

Targets.—In order to achieve a production of 450,000 tons of soda ash, the target capacity of 530,000 tons has been proposed for 1965-66.

Schemes licensed.—The schemes licensed during the Second Plan period will on their implementation take the installed capacity up to about 730,000 tons as shown below :

	tons
Capacity at the end of the Second Plan	268,000
Expansion of M/s Tata Chemicals	36,000
Expansion of M/s Dhrangadhra Chemicals	Nil
New Plant of M/s. Bhiwandiwalla	66,000
TOTAL	370,000

Additional Capacity.—There is still a gap about 160,000 tons *vis-a-vis* the capacity target. Of this about 40,000 tons would be secured through the doubling of the Varanasi Soda Ash plant if the result of operation of the unit already installed justify further expansion of the modified soda ash process. A licence for the expansion has been given but foreign exchange arrangements to the satisfaction of the Goevrnment have yet to be made. The balance of capacity left over would provide scope for doubling the Porbandar plant which has been licensed, as well as establishing a new unit of 200 tons per day capacity, or expansion of the Bhiwandiwalla unit to 400 tons per day.

Production of soda ash in the Third Plan period :

The schedule for the completion of programmes under implementation and establishment of further capacity through new developments has to keep in the background the growth of demand for soda ash which is expected to be as follows :

	Estimated demand ('000 tons)
1961-62	260
1962-63	320
1963-64	350
1964-65	400
1965-66	450

The demand for heavy soda ash may be estimated at 160,000 tons in 1965-66. This quantity would be required mainly by the glass, bangles and bichromate industries. The production of 40,000 tons of soda ash by

M/s. Sahu Chemicals from its existing plant is expected to be of dense variety. In addition, M/s. Tata Chemicals (Mithapur) would produce 80 tons of heavy soda ash per day, *i.e.* about 26,000 tons per year as part of its expansion programme. Arrangements will have to be made for the production of the balance of about 94,000 tons in further planning of expansion under the soda ash industry as it will be desirable to meet the full demand from indigenous sources.

A price incentive has been provided recently through differential prices for light and heavy soda ash. Within the overall capacity for soda ash, a limit for this heavy chemical produced by the modified Solvay process will be set by the level of production envisaged for ammonium chloride under fertilisers and the share thereunder allotted to the manufacture of ammonium chloride from ammonia and hydro-chloric acid by straight combination. The Third Plan envisages a target for ammonium chloride in terms of 30,000 tons of nitrogen. Within this target for ammonium chloride about 10,000 tons of nitrogen would be accounted for by the direct combination process for ammonium chloride manufacture. On these assumptions, the capacity for soda ash manufacture by the modified process will have to be about 80,000 tons per year within the overall target for soda ash.

Estimated investment and employment.—It is estimated that in order to achieve the capacity target, the total investment requirements would be about Rs. 12 crores of which Rs. 6 crores would be in foreign exchange. The additional direct employment as a result of the expansion of the capacity envisaged would be about 3,000 persons.

Raw materials.—The raw materials for this industry are entirely indigenous. Of the production of 450,000 tons of soda ash it may be assumed that about 380,000 tons would be produced by the Standard Solvay process and 70,000 tons by the modified Solvay process. The raw material requirements for this pattern of production are as follows :

('000 tons)

Raw Material	For 380,000 tons by the Standard Solvay Process	For 70,000 tons by the modified Solvay Process
Salt	684	88
Limestone	570	..
Ammonium sulphate	2·7	..
Ammonia	..	25
Coke	46	46
Coal	190	14
Power	included in coal.	24 million kwh

The following table summarises the programme of development of the soda ash industry during Third Plan :

(in tons)

	1960-61	1965-66
Annual capacity	268,000	530,000
Production—		
(i) Light ash	145,000	290,000
(ii) Heavy ash	nil	160,000

C. Caustic Soda

I. Review of Progress in the Second Plan :

Targets.—The capacity and production targets of the caustic soda industry under the Second Plan were about 150,000 tons and 135,000 tons respectively by 1960-61. It was further envisaged that a part of the output would be converted to soda ash and the quantity available for sale would be 106,600 tons in 1960-61.

Capacity and production.—At the beginning of the Second Plan there were 12 units manufacturing caustic soda with a total installed capacity of 44,300 tons. During the Second Plan period 5 new units have gone into production *i.e.* M/s. National Rayon Corporation, M/s. Orient Paper Mills, M/s. Calico Mills, Bombay, M/s. Dharangadhra Chemical Works (Tuticorin plant) and M/s. J, K. Chemicals Ltd. Some further increase in capacity has been achieved by the expansion of existing units. The soda ash plant of M/s. Saurashtra Chemicals has also capacity to produce 20,000 tons of caustic soda by the chemical process. Thus, at present, there are 18 factories of which, 6 are attached to paper mills and one to a rayon factory. Two units produce caustic soda from soda ash, 11 units adopted the diaphragm process and 7 the mercury amalgam process. The state-wise distribution of the capacity at the beginning and at the end of the Second Plan period was as follows :

(Figures in tons)

Name of the State	1956 Capacity installed	1961 Capacity installed	Under construction
1	2	3	4
Andhra Pradesh	2,800	3,000	3,800
Bihar	1,980	6,000	..
Delhi & Punjab	7,610	10,660	6,600

1	2	3	4
Gujerat	10,855	35,000	2,400
Kerala	6,600	6,600	3,300
Maharashtra	..	13,600	..
Mysore	575	600	..
Madras	4,280	33,000	..
Orissa	..	3,250	..
West Bengal	9,600	12,730	..
TOTAL	44,300	124,440	16,100

The division of the installed capacity in 1956 and in 1961 as between the chemical and the electrolytic grade is indicated as follows :

	Capacity in 1956 (tons)	Capacity in 1961 (tons)
Chemical caustic soda	6,600	27,000
Electrolytic caustic soda	37,700	97,440

The total installed capacity for caustic soda at the beginning of 1956 and the year-wise production during the Second Plan period are given below :

	No. of Plants	Capacity	Production (in tons)
1956	12	44,300	39,416
1957	12	45,360	42,653
1958	15	63,655	57,188
1959	15	69,035	68,770
1960	18	118,643	96,711

Imports.—The quantity and value of caustic soda imported during the Second Plan period were as under :

	Quantity (in tons)	Value (in Rs. crores)
1956	93,594	5·44
1957	66,042	3·88
1958	61,735	3·95
1959	147,162	9·85
1960	53,150	2·81

Import of caustic soda is being handled since 1957 by the State Trading Corporation except for the rayon grade which the rayon manufacturers were allowed to import as actual users. The heavy imports effected in 1959 were partly for creating a buffer stock to prevent sharp increase in prices of this basic chemical.

Price and Protection.—The Tariff Commission submitted a report in 1958 on the continuance of protection to the caustic soda and bleaching powder industries. The important conclusion and recommendations in the report are :

(i) The protective duties on caustic soda, both solid and other sorts, should be retained at current rates of 30% *ad valorem* (preferential) and 40% *ad valorem* (standard) as long as the tariff value of Rs. 28 per cwt. of solid caustic soda and Rs. 45 per cwt. of caustic soda of other sorts is retained. If a change in tariff values is effected in the future, the protective duty should be correspondingly altered. Protection to the caustic soda industry should be continued for a further period of three years *i.e.* till 31st December, 1961. The break up of internal demand for caustic soda in 1958 and 1961 was estimated by the Commission as under :

(Figures in '000 tons)

Industry	1958	1961
Soap	23·0	28·0
Textiles	34·0	38·0
Paper	26·5	30·0
Rayon	28·0	46·0
Vanaspati	1·8	2·5
Petroleum Refining	3·0	2·7
Chemicals and Dyestuffs	2·0	4·0
Aluminium	1·6	3·5
Miscellaneous	4·1	4·3
TOTAL	124·00	159·00

(ii) Protection granted to the bleaching powder industry including bleaching paste should be discountinued after 31st December, 1958 and the quantum of revenue duty on the products may be fixed according to fiscal consideration.

(iii) An examination of the question relating to open wagon movement of salt after taking into account the steps adopted in other countries for the purpose should be undertaken by the Railway administration in consultation with the representatives of the industries concerned.

(iv) The Railway administration may take steps to provide an increasing number of tank wagons for the transport of caustic soda in liquid form.

(v) The Railway administration may consider the question of providing a few tank wagons on an experimental basis for the transport of liquid chlorine.

(vi) The question of developing the manufacture of di-calcium phosphate fertilizer should be kept in view when any fresh licence is issued for augmenting the production of electrolytic caustic soda.

(vii) The large scale salt works which propose to supply salt to industrial users should undertake production of salt of the grade acceptable to the chemical industry.

Government have accepted recommendations (i) and (ii) and have taken note of recommendations (iii) to (vi) with a view to implementing them as far as possible. The large scale salt works have been advised to take steps to improve the quality of salt for industrial use.

In 1959, the Tariff Commission also went into the question of the fair ex-works selling price of caustic soda and its by-products and recommended as follows :

Product	Fair Ex-Works ceiling Price per cwt.
Fused solid caustic soda	35
Caustic soda lye (on the basis of 100 per cent Na OH)	29
Caustic Soda flakes	40
Chlorine gas dry (naked)	13
Liquid chlorine	22·20
Hydro-Chloric acid (Commercial)	10·80
Bleaching powder	24·20

These recommendations which were to be in force for two years *i.e.* till the 31st December, 1960 were accepted by the Government. The selling prices were reviewed after taking into consideration representations received from the industry. Following are the revised selling prices for caustic soda which will remain in force for one year from the 1st February 1961 :

Name of article	Revised prices (per cwt.)
Caustic soda flakes	Rs. 41·50 (on ISI basis).
Solid	Rs. 36·50 (Do.)
Caustic Liquid	Rs. 81·50 (on a 100% basis).

On an invitation extended by the Japanese Consulting Institute, the Development Council for Alkalies and Allied Industries sent a delegation of 7 persons for study of electrolytic caustic soda plants in Japan.

Investment and employment.—The total investment in the caustic soda industry in India during the Second Plan period is estimated to have been Rs. 11 crores of which the foreign exchange component is about Rs. 7·5 crores. The total employment under this industry is estimated to be for 2,500 persons.

II. Programme of development in the Third Plan:

Estimated requirements.—Based on the requirements related to the targets of the various industries consuming caustic soda the demand for caustic soda for 1965-66 has been projected as follows :—

Consumer Industry	Estimated Consumption of Caustic soda in 1965-66 (in '000 tons)
Paper & Paper board	94
Rayon and staple fibre	90
Textiles	50
Soap	48
Aluminium	25
Petroleum refining	8
Vanaspati	4
Miscellaneous	30
TOTAL	339

or roughly 340,000 tons.

Target for capacity and production.—In order to meet the demand in full from indigenous sources a target capacity of 400,000 tons has been proposed for 1965-66. The schemes licensed so far under the Industries (Development & Regulation) Act 1951 would, if implemented, take the installed capacity to 319,563 tons. The State-wise distribution of the total licensed capacity (including that of the existing units) of the caustic soda industry was as follows at the beginning of the Third Plan :

Name of State	Annual Capacity (in tons)
Andhra Pradesh	16,170
Bihar	5,580
Delhi & Punjab	17,160
Gujarat	44,010
Kerala	14,850

Name of State	Annual Capacity (in tons)
Maharashtra	67,700
Madhya Pradesh	14,628
Mysore	9,575
Madras	67,200
Orissa	19,740
Rajasthan	9,900
Uttar Pradesh	16,500
West Bengal	16,550
TOTAL	319,563

In filling the gap in capacity *vis-a-vis* the target, schemes for captive caustic soda plants under Nepa Mills, the Organic Chemicals and Intermediates project of the Central Government and the Chemicals Project of the Durgapur Industries Board are expected to receive attention. The expansion of capacity for caustic soda in the public sector will depend on these three schemes. At present there is only one State undertaking in this field *i.e.* Travancore Cochin Chemicals.

In future licensing due consideration is expected to be given to the following aspects :

(a) Balanced growth of caustic soda capacity, *vis-a-vis* the requirements of the major regions of the country and for growth of capacity in less advanced areas, *prima facie* suitable for this industry ; and

(b) achievement of a minimum economic size of 50 tons per day for independent plants serving external markets.

Chemical caustic soda.—Although because of the comparatively limited demand for chlorine in India, it would have been desirable to produce more caustic soda by the chemical process, it is thought on the basis of present trends of the price relationship between caustic soda and soda ash that the production of chemical caustic soda may not exceed a figure corresponding to 10% of the soda ash production.

It has been estimated that only when the price of caustic soda is 2·0 to 2·2 times that of soda ash, chemical caustic soda begins to compete with electrolytic caustic soda. In view of the above, out of production of caustic soda envisaged by 1965-66, it seems probable that only about 32,000 tons would be produced by the chemical process, mainly as an outlet for the offgrade soda ash, the balance being by the electrolytic process. For the production of 32,000 tons of chemical caustic soda the quantity of soda ash required would be about 50,000 tons.

Mercury and diaphragm Cells.—Manufacture of electrolytic caustic soda by the mercury-amalgam process has the advantage of producing rayon grade caustic soda of high purity but requires the import of mercury on current account. The capital and foreign exchange requirements is also more than for the diaphragm cell, but the fuel, consumption of mercury cells is lower. On the other hand, the diaphragm cells while they require a little less capital and foreign exchange, produce caustic soda of lower purity and consume more fuel. Asbestos for diaphragm cells has also to be imported. Because of these nearly balancing factors it is very difficult to support one or the other of the two processes and each scheme proposed for development would have to be decided on merits.

Utilization of chlorine.—The production of chlorine along with the targetted output of electrolytic caustic soda in 1965-66 would be about 270,000 tons. In order to improve the economics the production of electrolytic caustic soda, it is desirable that chlorine should be utilised upto at least 75% of its production. An outlet of substantial size is envisaged for chlorine in the manufacture of polyvinyl chloride. The new process of phosphoric acid production making use of hydrochloric acid in place of sulphuric acid will present another major outlet for chlorine if it proves to be commercially feasible. A firm has been licensed in Maharashtra (M/s. Standard Mills) to exploit this new process. On the other hand, manufacture of di-calcium phosphate will present only a limited outlet for chlorine on account of the fact that being wholly insoluble in water (though citrate soluble) it is not expected to be a popular phosphatic fertilizer.

Raw materials, fuel and power.—The raw material requirement for the production of 340,000 tons of caustic soda will be as follows:

	(tons)
(a) By Chemical Process (32,000 tons of cuastic soda)—	
Soda Ash	50,000
Limestone	60,000
Coal	100,000
(b) By Electrolytic Process (308,000 tons of caustic soda)—	
Salt	600,000
Coal	450,000
Mercury	40
Graphite	2,750
Power	1,200 million Kwh.

Investment and employment.—It is estimated that in order to achieve the capacity of 400,000 tons at the end of the Third Plan, the investment requirement would be Rs. 11·5 crores of which the foreign exchange component would be about Rs. 5 crores. The additional employment generated as a result of expansion of capacity would be for about 4,000 persons.

The table below summaries the programme of Caustic Soda Industry during the Third Plan :

		(tons)
	1960-61	1965-66
Installed Capacity	124,440	400,000
Actual Production	97,000	340,000

D. Calcium Carbide

1. Review of Progress in the Second Plan :

Targets.—It was envisaged that by 1960-61 the installed capacity and production for Calcium Carbide would be about 26,200 tons and 24,000 tons per annum respectively on the basis of 300 working days.

Capacity and production.—At the commencement of the Second Plan, there were three units in existence :

Name of Unit	Annual Capacity (tons)
M/s. Birla Jute Manufacturing Co. Ltd., Birlapur (West Bengal) . .	3,300
M/s. Industrial Chemicals Ltd., Talaiyuthu, Madras	825
M/s. Travancore Electro-Chemical Industries Ltd., Chingavanam, Kerala .	1,000

M/s. Travancore Electro-Chemicals did not produce any calcium carbide since 1954 because of financial difficulties.

M/s. Birla Jute Manufacturing Co. expanded their capacity to 6,600 tons and M/s. Industrial Chemicals, to 10,075 tons per annum. These expansions were completed in 1959 and 1960 respectively bringing the total effective capacity of the industry to 16,675 tons. Another firm M/s. Calico Mills completed the scheme with a capacity of 6,600 tons per year in the Trombay area and went into production in the first quarter of 1961.

In addition the following three schemes were licensed:

M/s. Travancore Electro-Chemicals . . .	Expansion .	10,800 tons. per annum.
M/s. Indian Carbide Corporation	New (revoked)	6,600 tons. per annum.
M/s. D. C. M. Chemical Works	New for PVC .	13,200 tons. per annum.

Of these the second scheme has been revoked as the scheme was withdrawn.

The capacity at the beginning of each year and the annual production of calcium carbide in the Second Plan period are given below:

(Figures in tons)

	Capacity	Production
1956	4,125	2,890
1957	4,125	3,596
1958	4,125	3,797
1959	7,425	4,069
1960	16,675	9,915

Indigenous production was insufficient to meet domestic needs and the gap was filled through imports as indicated below:

	Import (tons)	Value (Rs. lakhs)
1956	5,976	37·3
1957	8,595	54·2
1958	9,588	52·9
1959	8,431	41·5
1960	5,995	30·2

Imports have been stopped from 1961.

In 1958 the Tariff Commission went into the question of continuance of protection to the Calcium Carbide industry and recommended that protection to the industry should be extended for a further period of three years beyond 31st December, 1958 at the existing rate of protective duty *i.e.*, 50 per cent *ad valorem*. This recommendation has been accepted by the Government.

The quality of the indigenous product, although satisfactory, in respect of acetylene yield, was said to be inferior because of higher phosphine content. The difficulty in obtaining product of desirable quality was mainly due to the inferior quality of raw materials namely limestone and coke. Since coke with ash, sulphur and phosphorus within relevant specification limits was not available, petroleum coke from Digboi refinery and imported was employed to bring down the phosphorus content of the carbide.

The total investment in the Calcium Carbide industry during the Second Plan period was Rs. 1·6 crores of which Rs. 1·25 crores was the foreign exchange component.

II. Programme of Development in the Third Plan:

The requirements of Calcium Carbide for the various users at the end of the Third Five Year Plan have been visualised as follows :

	Estimated consumption of Calcium Carbide (in '000 tons) in 1965-66
Dissolved acetylene manufactured in orgainised factories	25·0
Acetylene generated in engineering industries	15·0
Mine lighting, lighthouse and Miscellaneous uses	5·0
Organic Chemicals (PVC, Solvents etc.)	15·0
TOTAL	60·0

For production of 60,000 tons of calcium carbide, the capacity required would be 67,000 tons on the basis of 90% utilisation of capacity.

The total of existing and licensed capacity amounts to 47,275 tons. The balance of about 20,000 tons may be expected to be achieved by expansion of existing units and/or by the establishment of one or two new large units in suitable locations. In selection of suitable sites, attention has to be paid to availability of cheap electricity, proximity to sources of supply of good quality limestone and coal or charcoal and size of minimum economic units. These factors would be particularly important if the manufacture of polyvinyl chloride and other acetylene chemicals is visualised to be carbide based. High price and poor quality of carbide are likely to attract petrochemical feedstocks as alternative raw materials for carbide in the field of organic chemicals production. A revision of the target for calcium carbide may be called for, if the target for carbide-based polyvinyl chloride undergoes a change.

The total investment required for the installation of the additional capacity to reach the target capacity of 67,000 tons is estimated as Rs. 1·5 crores with Rs. 1 crore as the foreign exchange element.

The following table summarises the programme of development of the calcium carbide industry during the Third Plan:

	1960-61 (tons)	1965-66 (tons)
Annual Capacity	23,275	67,000
Production	9,915	60,000

E. Miscellaneous Chemicals

Miscellaneous chemicals cover a wide range of items of varying importance which find application in several industries as well as have other diverse uses for example alumina ferric in water purification, explosives for mining operations, H_2O_2 for medical use, bichromates for leather tanning etc. Adequate and regular supplies of basic chemicals at economic prices ensure the development of miscellaneous chemicals. There is keen international competition in various major items *i.e.*, sulphur, carbon black, potassium chlorate, bleaching powder etc., and proposals for indigenous manufacture of such items have to pay due consideration to optimum levels of quality production and size of markets.

1. Review of Progress in the Second Plan:

Targets and achievements.—Specific targets indicated in the Second Plan for miscellaneous chemicals are: sodium hydrosulphite 5,000 tons; carbon black 8,928 tons. Whereas the manufacture of sodium hydrosulphite commenced by the end of 1959, when a capacity of 2,300 tons per year was brought into existence by two new units, the progress on carbon black was confined to the beginning of preparatory work on a unit proposed for establishment at Durgapur.

Other major developments worthy of mention are the completion of the industrial explosives project of M/s. Indian Explosives Ltd. in 1959 and the expansion of capacity for hydrogen peroxide from 1,500 tons to 3,000 tons per year in 1960. In addition, manufacture of certain other inorganic salts was undertaken for the first time in the Second Plan period though production was sporadic *e.g.*, perborates, bismuth compounds, compounded electroplating nickel salts, and phosphorus trichloride.

The progress of production of selected miscellaneous chemicals between 1956 and 1960 is given below :

Year-wise Production of important miscellaneous Chemicals during the Second Plan

(Figures in tons)

Name of Product	1956	1957	1958	1959	1960
1	2	3	4	5	6
Potassium chlorate . . .	2,276	2,287	2,777	2,669	3,429
Hydrogen peroxide . . .	525	611	937	1,066	1,173
Bichromates	3,264	3,672	3,444	4,329	5,032
Industrial explosives . .	..	..	219	3,477	6,385
Safety fuse (million coils) . .	0·63	0·79	0·69	0·96	3·26
Sodium bicarbonate . . .	4,452	4,784	5,427	5,662	7,577
Liquid chlorine . . .	15,076	15,693	20,066	24,388	31,615

1	2	3	4	5	6
Bleaching powder	4,657	5,343	6,509	5,105	5,973
Bleaching earth	1,510	1,715	2,137	2,553	2,800
Zinc chloride	958	750	751	988	1,128
Copper sulphate	1,980	1,884	2,088	3,097	3,876
Sodium sulphide	3,060	3,264	4,020	4,363	2,302
Alum (ammonia)	3,288	5,148	4,680	4,932	4,243
Hydrochloric acid	10,584	11,400	11,064	10,491	9,893
Nitric acid	1,356	1,368	1,536	1,695	5,200
Aluminium sulphate, ferric	25,325	30,341	32,077	40,902	52,285
Titanium dioxide	1,700	1,671	1,715	1,842	2,678
Ammonium chloride	4,698	5,205	6,640	5,281	13,000
Phosphorus trichloride	..	..	17	61	130
Sodium sulphate	8,077	9,906	17,536	21,930	15,466

II. Programme of Development in the Third Plan :

Based on the projections of the demand situation in 1965, targets have been recommended as follows for certain major chemicals by the Development Council for Alkalies :

Production	1965-66 Estimated demand (tons)	Target	
		Capacity (tons)	Production (tons)
Sodium hydrosulphite	10,000	12,000	10,000
Potassium chlorate	8,000	9,500	8,000
Hydrogen peroxide	8,000	9,500	8,000
Sodium bi-carbonate	20,000	20,000	20,000

The above targets have been accepted for the Third Plan.

It is further envisaged that production of the following chemicals for the first time or expansions in output of the following items already under manufacture would take place under the Third Plan :

(a) *Barium Chemicals.*—Barium Carbonate, Barium Nitrate, Barium Sulphate, Barium Chloride and Barium Sulphate are the principal barium compounds which are used in various industries. Except Barium Sulphide and Barium Carbonate, the others are wholly imported. The present imports amount to about Rs. 20 lakhs and the total requirements by the end of the 1965-66 are estimated to be about Rs. 50 lakhs.

Barium Carbonate and Barium Chloride are used for refining salt brine employed for the alkali industry ; Barium Carbonate finds extensive use in the production of rodenticides, case hardening compounds and carburising stores; Barium Nitrate is extensively used in pyrotechnic compositions, while Barium Sulphate is used in paints and pigments, paper etc.

Baryte, the principal mineral for preparing the Barium Chemicals is extensively available in Cuddapah, Anantpur, Kurnool etc., of Andhra Pradesh. Four schemes for manufacture of these chemicals have been licensed and when these schemes are implemented by 1965-66, production of all the barium chemicals will have been established.

(b) *Aluminium Chloride Anhydrous.*—The demand for this item is expected to arise in connection with the manufacture of organic chemicals and intermediates. Provision has been made for the manufacture of 4,000 tons of anhydrous aluminium chloride in the scheme of M/s. Standard Mills in Maharashtra for the integrated development of organic chemicals.

(c) *Elemental Phosphorus.*—The combined demand for red and yellow phosphorus by the end of the Third Plan is envisaged at about 2,000 tons, for the match industry (500 tons) and for the manufacture of different phosphorus compounds. At current c.i.f. prices, imports of this order would require about Rs. 45 lakhs of foreign exchange. A proposal for the setting up of a plant in the Public Sector for the manufacture of phosphorus by electro-thermal process is under consideration.

(d) *Silver Nitrate.*—The programmes for the manufacture of photographic films and paper are expected to create a new and sizeable demand for silver nitrate. A raw film project has been set up in the public sector and its requirement of Silver Nitrate is estimated at 54 tons. It is expected that production of this order would come into existence in step with these new developments.

(e) *Titanium Dioxide.*—The requirement of the product by 1965-66 is estimated at about 16,000 tons. The capacity of M/s. Travancore Titanium Products Ltd. is being expanded from 3,600 tons to 24,500 tons per year, half of this being intended for export. Another unit with a capacity of 4,400 tons of TiO_2 has been licensed to M/s. Nowrasjee Wadia.

(f) *Sodium sulphate.*—Arrangements for the indigenous supplies of this chemical are expected to assume special importance *pari passu* with the expansion of the paper industry which is the principal consumer of anhydrous sodium sulphate. Based on the production target set for the paper industry, the requirements of sodium sulphate are estimated at about 75,000 tons by 1965-66. Inclusive of other miscellaneous demands, the over-all requirements by 1965-66 would go up to 85,000 to 90,000 tons. As against this

level of future demand in 1965-66, the current picture of likely indigenous availability of sodium sulphate is roughly as follows :

	tons
By-product of bichromates, and nitric acid and hydrochloric acid manufacture by salt-acid process	6,600
By-product of rayon and staple fibre plant	23,460
Didwana sulphate	15,000
TOTAL	45,060

There is also a proposal to set up a Sodium Sulphate recovery unit at the Sambhar Salt Works, with an annual capacity of 10,000 tons.

If the rayon and staple fibre factories instal new facilities or expand their existing facilities so as to recover in the calcined form the full supplies of by-product sodium sulphate, the gap between the target and the present capacity will be narrowed. There is a potential availability of an additional 65,000 tons by 1965-66 as by-product of rayon and staple fibre plants if all of them are equipped with facilities for the full recovery and calcination of sodium sulphate.

(g) *Sulphur from Pyrites.*—India's requirements of elemental sulphur has so far been met entirely by imports, the quantity and value of which during the last few years were as follows :

	Import ('000 tons)	Value (Rs. crores)
1956 (Apr.-Dec.)	64	1·70
1957	115	3·42
1958	118	2·36
1959	144	2·60
1960	183	2·81

It may be pointed out that there was a sharp fall in the international price of sulphur in 1958. The easy availability of sulphur in the subsequent period was mainly due to the large-scale mining of sulphur by the Frasch Process from the extensive under-water deposits in the Gulf of Mexico and recovery of sulphur from large reserves of sour natural gas discovered in the U. S. A., Canada and France. Even so, efforts were continued to produce elemental sulphur indigenously in order to reduce our dependence on imports of this basic commodity. So far, no workable deposit of elemental sulphur has been found in the country. But large reserves of pyrites have been proved near Amjore in the Shahabad district of Bihar. The extent of proved reserves is over 68 million tons averaging about 40% sulphur

and the probable reserves are assessed at about 384 million tons. Preparatory steps have been taken to test bulk samples from these pyrites deposits for sulphur manufacture by the Orkla process. The Government of India have formed a subsidiary corporation of the National Industrial Development Corporation under the name "Pyrites and Chemicals Development Corporation Ltd." This corporation is arranging with M/s Orkle of Norway for large scale trials (in Norway) with this ore for the production of Sulphur. If the results of these trials are satisfactory a detailed project report for a sulphur recovery plant will be prepared. Under the physical programmes envisaged for the public sector in the Third Plan, the project for extracting sulphur from pyrites estimated to involve a fixed outlay of Rs. 5 crores for producing 84,000 tons of sulphur per year, has been included.

In mining pyrites, some quantities of fines would be simultaneously produced which could be used directly for the production of sulphuric acid. A programme for utilizing pyrites for the production of sulphuric acid economically from pyrites 'fines' within a radius of about 200 miles from its source is being organized.

(h) *Carbon Black.*—Carbon black has not been produced in India so far. The entire requirement of the country has been met by imports which were as follows during the last few years :

	Imports (tons)	Value (Rs. lakhs)
1957	8,774	99·54
1958	9,937	120·54
1959	12,372	145·95
1960	14,220	170·54

On the basis of targets set for industries consuming carbon black *e.g.* tyres, rubber, paints and printing ink it has been envisaged that about 35,000 tons of the material would be required annually by 1965-66. Of this total requirement, 30,000 tons would have to be in the form of furnace black and the balance as channel black.

During the Second Plan period preliminary investigations for the manufacture of carbon black were carried out by the National Industrial Development Corporation. In view of the interest shown by private enterprise, its manufacture has been finally assigned to the private sector and the following firms have been licensed for the manufacture of carbon black :

M/s. Philips Carbon Black Ltd., — In collaboration with Philips Petroleum Co. of U. S. A.
Capacity 13,400 tons/year
Location: Durgapur, West Bengal.

M/s. J.B. Industries, Calcutta — In collaboration with Continenta Carbon Co. of U.S.A.
Capacity 1,000 tons/year
Location: Naharkatiya, Assam.

The two firms mentioned above will manufacture furnace black. The plant at Durgapur would use coke-oven gas & coal-tar distillate as raw material & the one at Naharkatiya would be based on natural gas.

(i) *Industrial Explosives.*—As compared to the consumption of about 8,000 tons of industrial explosives in the last year of the Second Plan, the following are estimated as the requirements of commercial blasting explosives by 1965-66 :

	Demand Estimated for 1965-66
Blasting explosives	20,000 tons.
Safety fuses	25 million coils
Detonators	80 millions nos.

In 1960, M/s. Indian Explosives Ltd. were licensed to expand its factory at Gomia to produce 15,000 tons/year of explosives. They are also an important producers of safety fuses. Another firm has been granted a licence to establish capacity for the manufacture of 64 millions detonators/year. M/s. Indian Oxygen Ltd., have been manufacturing liquid oxygen blasting explosives (loxite) and as a result of some technical improvement, substantial quantities of loxite may be expected to be consumed in the open cast mining of coal, iron ore, limestone and other minerals. A target of 9,000 tons has been envisaged for loxite explosives. It has to be pointed out that there could be some measure of overlapping in the targets set for these two categories of industrial explosives.

(j) *Nitric Acid.*—In the Second Plan period, three nitric acid plants have been established—all as captive units for self-consumption :

Capacity of 41,000 tons/year at Sindri Fertilizers and Chemicals Ltd. for the manufacture of ammonium sulphate/nitrate.

Plant of 3300 tons/year capacity at M/s. Indian Explosives Ltd., Gomia in Bihar for the manufacture of nitro-glycerine and other nitro-compounds.

Plant of 200,000 tons/year capacity at Nangal Fertilizers and Chemicals in connection with the manufacture of nitro-limestone fertiliser.

During the Third Plan the following major schemes would go into production :

Nitric acid plant under Rourkela Fertilizer Factory.

Nitric acid plant under Trombay Fertilizer Plant.

Expansion of capacity under M/s. Indian Explosives Ltd., Gomia.

Nitric acid plant under the Basic Chemicals and Intermediates (BCI) plant at Panvel for the manufacture of nitrocompounds.

The manufacture of nitric acid under the schemes at (c) and (d) above would have to be organised on the basis of market supplies of liquid ammonia. For meeting this demand as well as other miscellaneous requirements, some surplus capacity for ammonia is being planned in the synthetic ammonia plants proposed to be established as an integral part of manufacture of nitrogenous fertilizers.

(k) *Laborators Reagents & Fine Chemicals.*—These are critical materials for process control and research in an expanding industrial economy. The items in demand are large though the quantities involved under each item are small. The approach to the problems of development in this field which does not lend itself to mass production techniques and calls for a high level of quality consciousness has to be different from that associated with heavy chemicals manufacture. Recently M/s. Sarabhai Merck Private Ltd., have undertaken the production of fine chemicals and laboratory re-agents at their factory in Baroda on a systematic basis. It is difficult to make an accurate forecast of requirements in this field. From general considerations it appears necessary as well as feasible to achieve a target of Rs. 75 lakhs for these products in terms of output value by 1965-66.

Investment.—Investments on schemes such as nitric acid manufacture, sodium sulphate recovery etc. which form part of larger schemes would be covered under the investment on the parent schemes. The investments on independent miscellaneous chemical industries may be of the order of Rs. 30 crores during the Third Plan period.

44. COAL CARBONISATION AND COAL TAR DISTILLATION

In India, so far carbonisation of coal has been limited to production of hard coke in the beehive and by-product coke ovens and town gas in horizontal retorts. Hard coke is a major raw material for production of iron and steel; hence, most of the large scale coke ovens are attached to steel works. Hard coke is also used for production of ferromanganese, calcium carbide, synthetic ammonia for fertilisers and chemical lime for sugar and soda ash industries. It is essential for foundry operations in the engineering industries.

The process of carbonisation can be distinctly divided into two types—(a) high temperature carbonisation which is resorted to for manufacture of hard coke and (b) low temperature carbonisation manufacturing smokeless domestic fuel popularly known as soft coke. In the process of carbonisation of coal, valuable by-products are obtained which provide, directly or after further processing, primary raw materials for large number of basic industries such as plastics, pharmaceuticals, synthetic rubber, explosives and dye-stuffs.

The process is essentially a method of destructive distillation of coal in the absence of air. Most of the volatile matters distills off leaving a residue known as coke. High temperature carbonisation (above 1200°C), in the manufacture of hard coke, takes advantage of the caking properties in coal. The manufacture of town gas calls for high volatile medium caking coal. The product of low temperature carbonisation, in which non-caking or semi-caking coals are subject to partial devolatilisation, is a smokeless domestic fuel.

In the following sections, the carbonisation industry has been separately dealt with under the following heads:

(a) High temperature carbonisation—hard coke,

(b) Low temperature carbonisation—soft coke,

(c) By-products recovery—processing of coke oven gases and coal tar distillation.

A. High Temperature Carbonisation—Hard Coke

1. Review of Progress in the Second Plan:

Targets.—As against an overall carbonisation capacity of 3·5 million tons in terms of coal throughput in 1955-56, it was envisaged under the Second Plan that the capacity for coking of coal would increase to 10·91 million tons by 1960-61. The carbonisation capacity of the cokeries attached to the steel plants was envisaged at 9·83 million tons, that of the Durgapur Coke Oven Project of the West Bengal Government at 0·44 million tons and of the 4 merchant cokeries in the private sector, the Giridih coke ovens of the Central Government and the plant attached to the fertiliser works at Sindri together at 0·64 million tons in 1960-61. Corresponding to the coal throughput capacity of 10·91 million tons, the production of coke in 1960-61 was reckoned at 8·2 million tons.

The beehive coke ovens operating on a small scale were expected to carbonise about 160,000 tons of coal and provide nearly 120,000 tons of coke per annum during the period of the Second Plan.

Capacity and Production.—Before the commencement of the Second Plan, the annual capacity for the production of by-product hard coke by high temperature carbonisation was of the order of 3,471,000 tons in terms of coal carbonised. The producers in the private sector were M/s. Tata Iron & Steel Company, M/s. Indian Iron & Steel Company and the 4 merchant cokeries *viz.*, Lodna Colliery Company, Barakar Coal Company, Bararee Coke Company and Bhowrah Coke Company; and in the public sector, the producers were the Giridih Coke Ovens plant and the Sindri Fertiliser Factory. During the period of the Second Plan, four more plants were set up in the public sector, three of which were developed in conjunction with the Bhilai, Rourkela and Durgapur steel plants and the fourth as a merchant cokery by the West Bengal Government at Durgapur.

At Rourkela, 3 batteries of 70 ovens each have been commissioned. The first battery was commissioned in December, 1958, the second in March, 1960 and the third early in 1961. The three coke oven batteries together have a capacity of about 1·6 million tons of coal throughput (equivalent to 1·2 million tons of coke). Production during 1960 was 502,000 tons of coke. At Bhilai, 3 batteries of 65 ovens each have been installed. The first battery was commissioned in January, 1959, the second in December, 1959 and the third in December, 1960. The capacity of these coke ovens is about 1·6 million tons of coal throughput (equivalent to 1·2 million tons of coke) per annum. Production of hard coke at Bhilai during 1960 was 616,000 tons. Three coke oven batteries of 78 ovens each have been installed at the Durgapur steel plant. The first battery was commissioned in November, 1959 and the second in October, 1960. The construction of the third battery has also been completed and it is expected to be commissioned shortly. The capacity of these coke ovens is about 1·9 million tons of coal throughput (roughly equivalent to 1·4 million tons of coke). Production of hard coke during 1960 is estimated at 406,000 tons. The Durgapur Coke Ovens Project of the West Bengal Government went into production in 1959. Production during 1960 was 216,500 tons of hard coke.

There has been no increase in the capacity of the coke ovens attached to the Sindri Fertiliser Factory. It was also decided not to renovate or expand the Giridih Coke Ovens. The production of hard coke at the Sindri Fertiliser Factory during the period of the Second Plan was as follows :

	('000 tons)
1956	225
1957	229
1958	229
1959	226
1960	217

The capacity of the merchant cokeries in the private sector has increased to 307,000 tons, as envisaged in the Second Plan with the implementation

of the rehabilitation programme of the Bararee Coke Company. New coke oven batteries have been set up at the works of M/s. Indian Iron & Steel Company and M/s. Tata Iron & Steel Company as part of their expansion programme for steel capacity. The Kulti Coke Oven plant of the former has, however, been permanently shut down. The existing capacity of the coke ovens of M/s. Indian Iron & Steel Company is about 2·24 million tons of coal throughput (equivalent to about 1·7 million tons of coke) per annum. Capacity of the coke ovens at the works of M/s. Tata Iron & Steel Company is of the order of 2·4 million tons (coal).

The overall capacity for production of by-product hard coke in the country as at the beginning of the Third Plan is estimated as under :

	Annual Carbonisation Capacity (March, 1961) ('000 tons of coal)	
Private Sector		
Steel Plants	4,600	
Merchant Cokeries	307	4,907
Public Sector		
Giridih Coke Ovens	56	
Sindri Fertiliser Factory	300	
Steel Plants	5,100	
Durgapur Industries Board	400	5,856
GRAND TOTAL		10,763

The production capacity for the manufacture of beehive coke is currently placed at about 440,000 tons of coke per annum.

Actual production of hard coke and its despatches for the market from the plants during the period of the Second Plan were as under:

(in tons)

	Production			Despatches		
	Steel and chemical plants	Coke plants	Beehive coke ovens	Steel and chemical plants	Coke plants	Beehive coke ovens
1956	1,974,322	255,311	266,000	70,648	254,139	272,900
1957	1,988,271	287,331	288,000	74,830	288,828	288,223
1958	2,352,000	303,008	368,000	111,870	301,622	373,496
1959	3,460,000	420,534	351,000	211,000	358,483	327,119
1960	4,087,000	482,000	204,000	203,500	484,000	208,000

The production of beehive coke has shown a substantial increase during the period of the Second Plan. As against an annual average of 120,000 tons of hard coke estimated as output of the beehive coke ovens, the actual production has been of the order of 266,000 tons in 1956, 368,000

tons in 1958 and about 204,200 tons in 1960. The sharp increase in the production of beehive hard coke during 1956-1959 has been due to the shortage of by-product hard coke for the market. With the increased supplies of the latter, the production of beehive hard coke declined in 1960. However, shortages have emerged again in 1961 as a result of the demands for market coke placed by the steel producers to step up their iron production.

Imports and exports.—There is no import of coke into India. Limited quantities are exported to Pakistan, Burma and some of the countries in South East Asia. Owing to shortage of hard coke, exports have progressively declined. The actual exports during the last few years have been as follows :

	Quantity (in tons)	Value (Rs. lakhs)
1957-58	82,000	31
1958-59	56,000	24
1959-60	19,000	9

Consumption and requirements.—An estimate of the market demand for hard coke in the country was made by the Coke Ovens Project Enquiry Committee in 1955. According to this Committee, the demand by 1960, exclusive of the consumption of steel works and their subsidiaries and the Sindri Fertiliser Factory, should have been 875,000 tons. Of this total demand, the requirements of sized coke was envisaged at 831,000 tons. Despatches in 1960 have been placed at about 895,527 tons. At that level there has been no shortage, judged against the requirement estimates of the Committee, in overall supplies though, from the point of quality, the availability of coke of suitable specifications for a new industries like calcium carbide and ferromanganese was not completely satisfactory. Towards the middle of 1958 Government appointed a Committee (Nayak Committee) to review the likely requirements of hard coke by 1962 and to recommend measures for creating additional capacity in connection therewith. The Nayak Committee submitted its report in 1959. According to its findings, the requirement of hard coke was estimated to increase progressively from 731,000 tons in 1958 to 1,418,000 tons by 1962. 90% of this demand was expected to be for sized coke (plus 1 inch) and the balance for unsized coke and coke breeze. The industrywise requirements were estimated as follows :

Name of industry	Demand in tons in 1962
Potteries, ceramics and enamel	29,500
Paper (includng paper board pulp and newsprint units)	3,000
Jute and textiles units	16,000
Chemical (excluding chemical carbide) factories	75,000
Calcium carbide plants	25,000
Refractories	125,000
Re-rolling mills	3,800

Name of industry	Demand in tons in 1962
Glass works	10,000
Electric and cable works	3,000
Cement works	9,000
Engineering works	175,000
Foundries	400,000
Ferromanganese works	75,000
Steel works	70,000
Railways including port trust and light railways	61,800
Small industrial units	129,000
Small scale industries	75,000
Vanaspati works	7,500
Sugar mills	35,000
Educational institutions	3,000
Export	50,000
Miscellaneous	13,000
Unforeseen demands	25,000
TOTAL	1,418,300

After taking into account the programme in the public and private sectors for the production of hard coke, the Committee came to the conclusion that there would be a shortage of about 340,500 tons of hard coke by 1962 and visualised that a part of the deficit (to the extent of 150,000 tons) would be met by beehive hard coke. The analysis of the situation made by the Committee showed the need for setting up additional capacity for the production of at least 190,000 tons of bye-product hard coke per annum by 1962. In the context, the Committee recommended that the coke oven plant set up by the Durgapur Industries Board at Durgapur should be doubled. Though this would temporarily create some surplus capacity, the growth of demand was expected to eliminate the imbalance before long.

Based on the recommendations of this Committee, the doubling of the Durgapur Coke Oven Plant was approved for implementation. The work on this expansion programme, which was taken in hand soon after, is expected to be completed by the end of 1962.

II. Programme of Development in the Third Plan:

Estimated requirements.—The major part of the expanded requirement of sized hard coke in the period of the Third Plan would arise from the expansion of capacity of the iron and steel industry. On the basis of the production targets of 9·2 million tons of steel ingots, and 1·5 million tons of pig iron for market, the demand for sized hard coke for the steel industry

would amount to about 9·63 million tons by 1965-66. Adequate capacity for meeting these requirements is being planned in the cokeries attached to the steel plants.

There will be only a small increase in the requirement of coke for the fertiliser industry. Additional capacity for fertiliser factories with the exception of doubling of M/s. Sahu Jain Chemicals, is being planned on raw materials other than coke.

The market requirements of hard coke, which was estimated by the Nayak Committee at about 1·4 million tons in 1962 is expected to increase to about 2 million tons on the basis of the targets envisaged for the different consuming industries. The industrywise requirement estimated on pattern adopted by the Nayak Committee is roughly as follows:

Industry	Exstimated demand of hard coke in 1965-66 (tons)
Potteries ceramics and enamel works	35,000
Paper, paperboard and newsprint	4,000
Jute and textiles works	17,000
Chemical (excluding calcium carbide) factories	110,000
Calcium carbide plants	45,000
Refractories	150,000
Re-rolling mills	5,000
Glass works	18,000
Electric and cable works	6,000
Cement works	11,000
Engineering works	200,000
Foundries	750,000
Ferromanganese	150,000
Steel works (the Mysore Iron & Steel)	70,000
Railways (including port trust and light railways)	80,000
Small industrial units	175,000
Small scale industries	90,000
Vanaspati works	9,000
Sugar mills	50,000
Educational institutions	5,000
Miscellaneous	25,000
Unforeseen demands	30,000
TOTAL	2,035,000

In the above estimate no provision has been made for exports. Some of the projections of demand require to be further gone into, such as, the consumption requirements of refractories, and the question of overlapping of demands between the estimates for foundries and for jute textiles, cotton textiles and small industrial units. Until this is done, the estimate for 1965-66 has to be regarded as provisional.

Of the total requirements, about 200,000 tons will have to be special grade for the production of ferromanganese, calcium carbide and other chemical products.

Schemes under implementation:

Coke ovens attached to the steel plants.—In connection with the expansion of the steel industry, additional coking capacity is planned at the 3 steel works of Rourkela, Bhilai and Durgapur. Details regarding the number of coke ovens and their schedule of installation, are yet to be settled. Tentatively, it is visualised that the annual capacity for coal carbonisation in terms of coal throughput will be increased at the Rourkela Steel Works to about 2·5 million tons. at the Bhilai Steel Works to 3·3 million tons and at the Durgapur Steel Works to 2·38 million tons. The capacity of the coke ovens linked with the Bokaro Steel Project will be decided upon at the time of the preparation of the project report. Tentatively, it is visualised that the capacity will be of the order of 1·9 million tons.

No expansion in the capacity of the coke ovens at the works of M/s. Tata Iron & Steel Company and of M/s. Indian Iron & Steel Company has so far been envisaged during the period of the Third Plan.

On the above basis, the total capacity of the cokeries attached to the steel works is expected to be of the order of 15 million tons per annum by 1965-66.

	Actual capacity (million tons of coal carbonized)
A. Public sector:	
Hindustan Steel, Bhilai	3·30
Do. Durgapur	2·38
Do. Rourkela	2·50
Do. Bokaro	1·90
TOTAL	10·08
B. Private sector:	
Indian Iron & Steel	2·24
Tata Iron & Steel	2·40
TOTAL	4·64
GRAND TOTAL	14·72

It is also proposed to set up, during the Third Plan, production facilities for carbonising 1 million tons of lignite at Neyveli into hard coke as part of the Neyveli pig iron project. Preliminary investigations on this project are at present in progress. The output of hard (lignite) coke from this plant will be of the order of 300,000 tons.

Merchant cokeries.—There are at present no programmes for increasing the capacity of the merchant cokeries in the private sector over the existing level of 307,000 tons.

The expansion of the Durgapur Coke Oven Plant of the West Bengal Government included in the Third Plan has been cleared for implementation. After this expansion programme is completed, the plant will have an annual capacity of 880.000 tons of coal throughput per annum and the production of coke will be of the order of 660,000 tons. The plant will be equipped for the recovery of various by-products such as benzene, toluene and solvent naphtha. A tar distillation unit of 100 tons per day capacity is also under construction. The coke oven gas from this plant will be partly piped to Calcutta. A washery is being set up, as an integral part of the expansion programme, to supply washed coal to the coke oven plants. A provision of about Rs. 8·0 crores has been made in the Third Plan in connection with the expansion of the coke oven plant, the installation of a gas grid, a tar distillation plant and a washery and other connected developments.

Production of quality coke required for the calcium carbide and ferromanganese industries should be undertaken at the Durgapur Coke Plant. The supplies from Giridih Coke Ovens are expected to cease during the middle of the Third Plan period since there is at present no proposal for the renovation of this plant.

On the basis of the expansion programmes enumerated above, the total capacity for by-product hard coke, including the capacity existing at the Sindri Fertiliser Factory, would be of the order of 16·7 million tons in term of coal input per annum.

As regards market requirement of coke estimated at about 2 million tons, it is expected that the availability on an assured basis from by-product coke ovens will be of the order of 1·61 million tons by 1965-66, as indicated below :

	('000 tons.)
Durgapur Industries Board	660
Merchant cokeries in the private sector	300
Indian Iron & Steel Co.	350
High temperature carbonisation plant at Neyveli	300
TOTAL	1,610

It is assumed that M/s. Indian Iron & Steel Company would supply about 350,000 tons of hard coke per annum to the market. On the other hand, no credit has been taken of supplies that might be available from the cokeries attached to the steel plants in the public sector. Since however, coke ovens are likely to be commissioned somewhat earlier than the blast furnaces, it is possible that some surplus coke would be available from the steel plants in the public sector until full capacity for pig iron is achieved. Such surpluses may be of the order of about 100,000 tons per annum.

The gap between requirements and availability could also to some extent be bridged by installing the coke-oven at the Bokaro Steel Plant somewhat in advance of the pig iron and steel making capacity.

In estimating the total availability, account has also to be taken of the production of hard coke in the beehive coke ovens. During periods of shortage, the production of beehive coke has shown considerable increase and has been able to fill the gap between supply and requirement. Though the production of beehive coke is wasteful, the quantity of coal consumed in beehive ovens is greater than in by-product ovens, and the quality is inferior compared to that of the by-product coke, its production provides a ready outlet for slack coal (coking) which would otherwise accumulate at the collieries. The beehives coke is also slightly cheaper than the bye-product hard coke and would satisfy the requirements of small industrial undertakings and small sized foundries. It may therefore be assumed that about 200,000 to 250,000 tons of beehive coke will continue to be produced per annum during the Third Plan period.

Most of the coke is needed for steel production and the coal therefore has to be of comparatively low ash content. Since reserves of known high grade coking coals in India are limited, the plans for the production of coke in the steel works envisage the use of washed coking coal. The installation of washing facilities for 11·63 million tons of raw coal was envisaged in the Second Plan, out of which 6·12 million tons of capacity has been established. The balance of washing capacity programmed under the Second Plan is expected to be established in full by the middle of 1963.

The expansion of steel production programmed under the Third Plan is estimated to require additional washing capacity of the order of 12·7 million tons in terms of raw coal. This additional capacity is to be established, partly by the expansion of washeries already in existence or in course of erection, and partly by establishing new washeries at Kathara, Karanpura, Ramgarh, Sundamdih and Jhillimili. The West Bengal Government have also a scheme to set up a coal washery in association with the Durgapur coke oven plant. Further, installation of new washing capacity

in the Sudamdih—Sutikidih area is also under consideration. The existing position and programmes for coal washeries under implementation or to be started in the Third Plan are summarised below :

	Capacity of raw coal (million tons)	Remarks
I. Coal washeries in operation		
1. Kargali	-	
2. West Bokaro	0·63	
3. Jamadoba	1·44	
4. Lodna	0·35	
5. Durgapur (H.S.D.)	1·50	
TOTAL	6·12	
II. Coal washeries included in the Second Plan (under implementation)		
1. Dugda No. 1	2·40	
2. Bhojudih	1·20	Expected to be commissioned in June 1962.
3. Patherdih	2·00	Expected to be commissioned in the third quarter of 1963.
TOTAL	5·60	
III. Coal washeries proposed for the Third Plan		
1. Expansion of Bhojudih washery	0·80	
2. Dugda No. 2	2·40	
3. Karanpura	2·80	
4. Kathara	3·00	
5. Ramgarh	1·50	
6. Kargali Extension	0·50	
7. Jhillimili	0·80	
8. Washery at Durgapur Coke Oven	0·80	
TOTAL	12·60	
9. Sudamdih	2·20*	

*This washery has been proposed in connection with the Jharia deep mines to be developed in the public sector. Only 0·5 million tons of washery capacity is expected to be available during the Third Plan period.

The following table summarises the programme of development of the high temperature coal carbonisation industry†:

	1960-61	1965-66
Number of companies	12	13
Actual capacity (million tons of coal carbonised)	10·76	16·70
Actual production (million tons of coke) (including beehive coke)	4·77	12·50

†The data are exclusive of the coke ovens of gas companies at Calcutta and Bombay. Coke from these plants being of poorer quality is mainly used for domestic purposes.

B. Low temperature Carbonisation—Soft Coke

1. Review of Progress during the Second Plan:

There was no organised production of soft coke in the country at the beginning of the Second Plan. There were, however, a large number of small-scale producers operating in the West Bengal—Bihar coal fields and producing about 1·8 million tons of soft coke per annum by direct pile-burning process which is wasteful.

While the importance of developing the production of soft coke was recognised, provision could not be made in the Second Plan for the setting up of soft coke plants except for the briquetting and carbonisation plant proposed as part of the South Arcot lignite project. Considerable preliminary work on the briquetting and carbonisation scheme was carried out during the period of the Second Plan. A pilot plant for conducting tests on the suitability of lignite for manufacture of soft coke was set up at Neyveli in 1957. On the basis of the experiments conducted at this pilot plant, a project report was drawn up for treating about 1·5 million tons of raw lignite per annum. Subsequently, global tenders were invited and orders placed for the supply of equipment with a West German consortium of firms.

The production of soft coke during the period of the Second Plan, which is given below, has remained more or less stationary. Since there has been no production in the organised sector, these data relate to production in the small-scale sector :

	'000 tons of soft coke
1956	1,652
1957	1,722
1958	1,785
1959	1,781
1960	1,816

II. Programme of Development in the Third Plan:

The briquetting and carbonisation plant at Neyveli which could not be completed during the Second Plan period is now expected to be in production by the middle of 1964. It is designed to produce 380,000 tons of carbonised briquettes per annum. The annual production of coke and by-products from this plant, when operating on full capacity, is estimated as follows:

	(tons)
Carbonised briquettes (*plus* 10 mm)	380,000
Char fines (*minus* 10 mm)	62,000
Tar	46,000
Middle oil	15,000
Kerosene oil	5,900
Light oil	490
Carbolic acid	1,340
Polyvalent phenols	1,400
Cresols	1,920
Xylenols	585

The physical programmes included in the Third Plan cover three low temperature carbonisation plants for the production of domestic coke. Locations at Jambad (West Bengal) Kothagudiam (Andhra Pradesh) and Karanpura (Bihar) are considered *prima facie* suitable for soft coke production. It is tentatively envisaged that the combined capacity of these plants would be of the order of 2·2 million tons of coal.

The approach to developments in the field of soft coke production is flexible under the Third Plan. The manufacture of this important domestic fuel has not till quite recently attracted much interest in the private sector, apparently due to the low profit margins. An industrial licence has been granted to M/s. Billarpur Collieries Co., Nagpur for setting up a low temperature carbonisation plant with an installed capacity of 360,000 tons of smokeless fuel.

C. Bye-products Recovery and Processing

Crude benzol and coal tar are the two principal bye-products of coal carbonization. Valuable raw materials such as benzene, toluene, naphthalene and phenol, which are required by a number of important industries, *viz.*, dye-stuffs, plastics, drugs can be recovered by a further processing of these bye-products. This section deals with the progress under the Second Plan and programmes for recovery of the by-products and their further processing under the Third Plan.

1. Review of Progress in the Second Plan:

Targets.—A clear picture of the facilities that would be set up for the recovery of crude benzol, and for its rectification into benzene and toluene, and of the capacity that would be built for tar distillation was not available at the time of the formulation of the Second Plan. On the basis of the programmes that had been decided upon by that time, it was envisaged that the actual installed capacity for the recovery of benzens would increase to 4·991 million gallons and of toluene to 1·378 million gallons by 1960-61. In the case of coal tar distillation, the capacity firmly envisaged was 177,500 tons by the end of the Second Plan. It was indicated that, on this basis, there was likely to be a deficit of the order of 150,000 to 200,000 tons of road tar by 1960-61. In this context it was stated that the quantum of further coal tar distillation capacity should be decided upon after taking a view on the petroleum refining as an alternative source of road tar (bitumen) supplies open for consideration.

The production targets for benzene and road tar were indicated as 2·9 million gallons and 100,000 tons respectively.

Capacity and Production.—At the beginning of the Second Plan there were 5 units engaged in the recovery of crude benzol. These units were attached to the steel plants at Jamshedpur and Burnpur and to the coke ovens of the Sindri Fertilizer Factory, the Bararee Coke Company and the Giridih Coke Ovens. The Burnpur, Sindri and Bararee plants were equipped for recovery of benzene and toluene while the one at Jamshedpur was engaged only in the recovery of toluene and de-toluated benzol. The Giridih Coke Ovens were producing only motor benzol.

During the period of the Second Plan, 4 new units for the recovery of crude benzol and its further processing into benzene and toluene were set up as adjuncts to the coke oven plants of the Bhilai, Durgapur and Rourkela Steel Plants and to the merchant cokery of the Durgapur Industries Board, West Bengal.

As regards coal tar distillation, there were 6 units operating in the private sector with an annual installed capacity of 75,000 tons of crude tar throughput at the beginning of the Second Plan. Since then, three new units have been set up as part of the by-products processing arrangements at the coke ovens of the three Government Steel Plants.

The capacity of various by-products units in existence at the end of the Second Plan is indicated below :

Benzol Rectification

(Annual capacity '000 gallons)

Unit	Benzene	Toluene
Bararee Coke Company.	28·5	7·5
Indian Iron & Steel Company & Tata Iron and Steel Company	1,630·0	386·0
Sindri Fertilizer Factory	270·0	30·0
Rourkela Steel plant	1,789·0	363·0
Bhilai Steel plant	1,595·0	386·0
Durgapur Steel plant	2,683·0	389·0
Durgapur Industries Board	363·0	117·0
TOTAL .	8,358·5	1,678·5

Coal Tar Distillation

	Annual capacity in terms of tar distilled (tons)
Existing capacity (private sector)	75,000
Rourkela Steel works	90,000
Bhilai Steel works	44,500
Durgapur Steel works	75,000
TOTAL .	284,500

The benzol rectification and tar distillation plants at the steel works in the public sector were set up late in 1960-61. Though the erection of these plants was completed, they had not gone into regular and full production at the end of the Second Plan.

The production of important coke oven bye-products during the period of Second Plan was as given below:

Name of product	Unit	1956	1957	1958	1959	1960
Benzene	'000 gallons	343·0	516·4	789·1	1,079·0	1,178·9
Toluene	'000 gallons	690·0	530·0	409·0	180·2	243·0
Creosote	'000 metric tons	6·8	6·18	4·43	4·98	7·55
Motor benzol	million gallons	0·73	1·23	0·9	0·73	0·86
Solvent naphtha	'000 gallons	61·5	92·3	100·2	100·2	105·0
Naphthalene, refined	tons	950·6	803·4	695·8	646·8	588·0
Road tar	'000 tons	38·7	27·0	19·8	19·8	21·6
Pitch	'000 tons	3·7	4·2	4·6	6·0	5·1

The large gap between production and installed capacity for benzene currently obtaining is on account of lack of demand for it due to the delays which have occurred in the implementation of the organic intermediates project and the synthetic rubber project. The main outlet for benzene at present is in the manufacture of B.H.C. and D.D.T. Toluene is used mainly as a solvent and for the production of military explosives in ordnance factories. Motor benzol production has shown a slight decline due to the current surplus availability of motor spirit.

Imports and exports.—The major items of imports are phenol and solvent naphtha. The production of other items in the country is adequate to meet the requirement. Imports of solvent naphtha and phenol have been as follows:

		1957	1958	1959	1960
Phenol (pure and commercial)	tons	832·3	931·4	1,057·4	1,808·3
Solvent naphtha (crude)	'000 gallons	80·9	71·9	66·4	88·9

The major items of export are coal tar, pitch and napthalene. With the increase in capacity for the production of benzene, toluene, napthalene and other products currently available, there is scope for larger exports until the demand develops in the country. The Hindustan Steel Limited have been able to export some of these products, though on an intermittent basis. The large surpluses of these bye-products will be a major problem for at least the first three years of the Third Plan.

II. Programme of Development in the Third Plan:

Estimated requirements.—The demand for the organic chemicals produced from the bye-product of coal carbonisation is expected to show a steep rise on the basis of the targets for the chemicals and allied industries

visualised under the Third Plan. The projections of demand for 1965-66, whose details are discussed under the 'Organic Chemicals Industry' are given below :

	Estimated demand in 1965-66
Benzene	52,000 tons
Naphthalene	15,500 ,,
Phenol	14,300 ,,
Phthalic anhydride	10,000 ,,
Road tar (*see* petroleum refining industry)	628,000 ,,

Supplies of organic chemicals as bye-products.—Whereas the installed capacity for benzene at the end of the Second Plan was of the order of 26,800 tons per year in the public sector, and 6,000 tons per year in the private sector, totalling 32,800 tons, it is capable of being increased to about 50,000 tons (even without reckoning any supplies from the Bokaro Steel Plant) as a result of the installation of additional bye-product recovery and processing facilities under the various expansion schemes for coke production in the public sector. Though the decision to extend the bye-product recovery facilities as part of the steel expansion programmes has been taken in principle, the timing of the implementation of these programmes was left to be reviewed and firmly decided upon as soon as a clear picture of the growth of demand become available to the Hindustan Steel. The investment under steel expansion programmes estimated under the plan would have to be supplemented for the creation of these facilities. A picture of the production potential for benzene at the end of the Second Plan and by 1965-66 is given below :

	At the end of the Second Plan (tons)	After expansion under the Third Plan (tons)
Public sector :		
Rourkela Steel works	7,140	11,900
Bhilai Steel works	6,380	12,480
Durgapur Steel works	10,750	15,000
Sindri Fertilizer works	1,080	1,080
Durgapur Industries Board	1,450	2,900
	26,800	43,360
Private sector :		
Indian Iron & Steel Co. and Tata Iron & Steel Co.	6,000	6,000
TOTAL	32,800	49,360

As regards naphthalene and phenol of bye-product origin the position relating to their availability is envisaged as follows :

(tons)

	Naphthalene	Phenol
Rourkela Steel plant	5,000	350 (pure)
Bhilai Steel plant	3,400	600 (Crude phenolates 15% phenolic acid content expressed on 100% basis).
		1,900 (Crude phenol).
		1,680 (Phenolic acid).
Durgapur Steel works	3,600	..
Durgapur Coke ovens	1,400	..
Neyveli Lignite Corpn.	..	1,500
Existing private sector units	2,000	..
TOTAL	15,400	6,030

In addition to these three major organic chemicals, a large number of other products are also expected to become available from the bye-product recovery and processing operations at the steel works *e.g.*, toluene, xylene, cresols, solvent naphtha, wash oil, anthracene and anthracene oil. The successful marketing of these various bye-products is a factor of some significance to the operating results of the steel plants. The scope for the expansion of road-tar production has to be judged in relation to the latest estimate of demand for road-tar placed at 628,000 tons in 1965 on the one hand, and the anticipated supply of bitumen from petroleum refineries on the other. Even without reckoning bitumen supplies from the Gujarat Refinery, the deficit in the availability to be made good by way of road-tar would be only about 114,000 tons in 1965. This level of road-tar production would not provide a full outlet for the supplies of pitch from the tar distillation plants attached to the steel works and alternative possibilities for developing a profitable outlet for the surplus pitch would have to be explored. The question is engaging the attention of the Committee on Bye-Products of Coal Carbonisation, set up by the Ministry of Commerce and Industry to review the position regarding the recovery of bye-products from the coal carbonisation industry and suggest measures for its future development.

45. ORGANIC CHEMICALS

An extensive range of chemical products is covered under the term 'organic chemicals'. In the early years of the growth of this industry, the primary organic chemicals were derived from the processing of raw materials of vegetable origin *e.g.*, fermentation of molasses, destructive distillation of wood and glycerol from soap lye. This raw material base was widened after the Industrial Revolution and several of the organic chemicals were also derived as bye-products of the cokeries attached to iron and steel works and as derivatives of acetylene from calcium carbide. The role of calcium carbide was particularly significant in Germeny in the period following the first World War. Further diversification occurred as supplies from traditional sources fell short of the growing demands resulting from the production of several substitutes for natural products in the field of consumer goods and of primary raw materials themselves e.g., rayon and synthetic rubber. The latest to arrive on the scene are petroleum feedstocks from which a wide range of organic chemicals have been produced in the advanced countries during the last fifteen years. Today, the petro-chemical industry, which accounts for a large tonnage of organic chemical production, occupies a highly important place in the industrial economies of these countries. Also, the technological base has reached new dimensions and a wide range of choice of processes has been opened up for organising production facilities. Industrial complexes planned for joint production of many related organic chemical products to secure the benefits of integrated developments have become the order of the day.

Until the beginning of the First Five-Year Plan, the production of organic chemicals on volume basis was confined in India to alcohol, chiefly concentrated in Uttar Pradesh and Bihar, small quantities of wood chemicals at Bhadravati, primary aromatic hydrocarbons—benzol, benzene, toluene—at the Jamshedpur and Burnpur steel works, coaltar distillation products, glycerine and lastly, acetone from alcohol at the Cordite factory, Aruvankadu. The production of alcohol-based chemicals like ethyl chloride, ethyl acetate and ether was organised at some pharmaceutical establishments on a relatively small basis. During the First Plan period, the production of carbon disulphide, acetic acid, acetone and acetic anhydride was developed in captive plants for viscose and acetate rayon production. During the Second Plan period, capacity for benzol and its derivatives and coaltar chemicals was created on a substantial basis at the Bhilai, Rourkela and Durgapur Steel Plants. Capacity for chloro-benzene and chloral was developed in conjunction with D.D.T. manufacture. The production of the aliphatic hydrocarbons, ethylene from alcohol was established as an integral part of polyethylene production at Rishra by M/s. Alkali & Chemical Corporation and at Trombay by M/s. Union Carbide. The latter has also installed facilities for the manufacture of acetic acid, butanol, butyl acetate and certain other industrial solvents. The organic chemicals industry can thus be said to have advanced well beyond the threshold stage of development by the end of the Second Plan.

During the same period, the demand for organic intermediates and penultimates—these are products manufactured from the primary organic

chemicals by the well-known chemical transformation processes—has risen considerably as a result of the manufacture of finished products. These demands have chiefly stemmed from the dyestuffs, plastics (polystyrene from styrene, phenol formaldehyde and urea formaldehyde starting from phenol formaldehyde etc., synthetic drugs, detergents and paints and varnishes industries. In the context of these demands as well as of a scheme relating to the production of synthetic rubber, preliminary steps have been taken for establishment of production facilities in the new fields by many entrepreneurs involving foreign technical and/or financial collaboration.

The progress recorded under alcohol, primary aromatic hydrocarbons and coaltar chemicals during the Second Plan period and the programmes of development in these fields have been outlined under the sections dealing with 'Industrial Alcohol' and 'Coal-carbonisation and Coaltar, distillation', of this volume. The position in regard to the Organic Intermediates project in the public sector has been covered under 'Dyestuffs and Intermediates' industry. In the following section, the treatment of organic chemicals is confined to carbon disulphide, acetic acid, phthalic anhydride and phenol, benezene and napthalene and aliphatic hydrocarbons.

Programme of Development in the Third Plan:

The task of formulating a development programme for the organic chemical industry is beset with considerable difficulty in view of the following factors:

(i) inter-product competition in the field of consumer goods of synthetic origin *e.g.*, competition between different plastic products and synthetic fibres;

(ii) inter-process competition and shifts in raw material usage and technology for the production of individual products themselves *e.g.*, naphthalene or orthoxylene for phthalic anhydride and chlorobenzene or Cumene process for manufacture of phenol from benzene;

(iii) the large number of products involved, some in large quantities and some in smaller tonnages;

(iv) diverse stages of chemical processing involved, each resulting in distinct large volume organic chemicals before such chemicals end-up as plastics, dyestuffs, synthetic detergents etc., for the consumer market.

The targets to be proposed in this field have necessarily to be proceeded by an extensive and exhaustive study of the new developments in the advanced countries and the limits and scope for their adaptation in the context of the situation in the country. Such detailed studies could not be completed in time for embodying firm targets of development in the Report on the Third Plan. In these circumstances, while recognising the importance of the organic chemical industry and of the petro-chemical route for their production, the Plan has set out the position as follows:

Large-scale developments are envisaged in the field of organic chemicals almost for the first time. These may be said to have followed the build-up in the demand for many items as a result of the development of

allied chemical industries over the last decade *e.g.*, plastics, dyestuffs, drugs. New industries visulalised in the Third Plan like nylon and terelyne and further expansion in the existing lines over the next five years have been taken into account in fixing the levels of development appropriate in this field. The undermentioned targets for the three major items have to be regarded as provisional:

	Capacity target for 1965-66 (tons)
Phthalic anhydride	15,000
Phenol	15,000
Methanol	40,000

The targets as well as the lines along which the production of organic chemicals should be fostered over this decade are expected to come up for review of the Government from all aspects after the Petro-chemical Committee, set up by the Ministry of Commerce & Industry in November, 1960, has submitted its report.

Estimated demand for selected organic chemicals by 1965-66.—In relation to the industrial targets set for the Third Plan, which have been published in overall terms in Annexure II of Chapter XXVI of the Report and the details relating to which have been elaborated under different industries in this volume *e.g.*, levels of development of different plastic products under 'plastics industry', of different artificial fibres unders 'rayon and staple fibre industry', terelyne etc., under wollen textile industry etc., the requirements are expected to be as follows for a few selected items:

A. Intermediate chemicals

	Estimated requirements in 1965-66 (tons)	
(1) Acetic acid for—		
(a) Cellulose acetate filament	13,000	
(b) Cellulose acetate moulding powder and film base	5,000	
(c) Vinyl acetate	3,600	
(d) Dyestuffs, drugs & intermediates and penultimate	2,000	
(e) Miscellaneous	4,400	28,000
(2) Carbon disulphide	45,000	
(3) Phenol for—		
(a) Phenol-formaldehyde moulding powders and resins including laminates and adhesives	4,000	
(b) Synthetic drugs	1,000	
(c) Caprolactum	6,800	
(d) Alkyl phenol etc.	1,500	
(e) Pesticides, dyestuffs and miscellaneous	1,000	14,300

	Estimated requirements in 1965-66 (tons)	
(4) Phthalic anhydride for—		
(a) dyestuffs	3,000	
(b) plasticizers	3,000*	
(c) alkyd resins	3,000	
(d) polyesters and miscellaneous uses	1,000	10,000
(5) Methanol†		
In the form of A.C.K.O.		
(a) Plastic moulding powders and resins	8,000	
(b) Other uses	4,000	12 000
(c) Chemicals & dyes	3,000	
(d) Polymethyl methacrylate	1,500	
(e) Methylene chloride and other chloromethanes	1,500	
(f) Aircraft fuel	1,500	
(g) Miscellaneous	2,000	9,500
TOTAL OF (5)		21,500

B. Finished Products

(6) Rubber Chemicals, organic (accelerators, anti-oxidants and retarders)	3,000	

C. Primary Organic Chemicals—Aromatics Hydro-carbons

(7) Benzene		
For styrene production for polystyrene, synthetic rubber and miscellaneous uses	20,000	
For synthetic phenol	10,000	
For B.H.C.	6,000	
For D. D. T.	1,500	
For Dodecyl benzene	2,500	
For Maleic anhydride	2,500	
For Aniline	4,000	
For Mono & dischlorobenzene	1,500	
For Misc. industrial & solvent uses	4,000	52,000

*The demand for plasticizers is related to a target of 15,000 tons for polyvinyl chloride plastics and resins.

†Used in the form of formaldehyde for industries falling under (a) & (b) of the headl.

	Estimated requirements in 1965-66 (tons)	
(8) Naphthalene—		
For Phthalic anhydride	11,500	
For Dyestuffs	2,300	
For Miscellaneous uses	1,700	15,500

D. Primary Organic Chemicals—Aliphatic Hydro-carbons

(9) Ethylene—		
For polyethylene	25,000	
For styrene	6,000	
For vinylchloride	4,000	
For Miscellaneous including ethylene glycol	3,000	38,000
(10) Propylene—		
For polypropylene (4,000 tons)	4,500	
For propylene tetramer for synthetic detergents	3,000	
For miscellaneous	5,000	12,500

The requirements of benzene for synthetic phenol are assessed at 10,000 tons on the basis that about 4,500 tons of commercial grade phenol would become available from the by-product recovery and processing plants attached to the Neyveli low temperature carbonisation plant and the public sector steel plants. The details of availability from these by-product sources have been discussed under section (C) of the Coal Carbonisation Industry in this volume.

Against the background of the requirements, it is felt that the traditional sources of supply of the organic chemicals *e.g.*, alcohol, benzene, phenol and calcium carbide will require to be supplemented by the development of production linked with petroleum feedstocks for the various primary building blocks such as ethylene, propylene and benzene and their derivatives serving as intermediates *e.g.*, cumene, propylene tetramer. The problem of planning in this field thus becomes highly complex and specialised. Further, the targets set for the Third Plan may require to be reviewed if the economies of scale, which play a vital role in this field, require production to be organised in a bigger way even to start with.

Developments in the public sector.—A sizeable share of the development in this field has been allocated to the public sector. The production of major organic chemicals already planned is as follows:

(in tons)

	Capacity	Estimated production
(1) Phenol—		
(a) By-product phenol	6,030	4,500
(b) Synthetic phenol under the B.C.I. Project of Hindustan Organic Chemicals near Panvel	1,500	1,350
(c) Organic chemicals scheme of West Bengal Government at Durgapur	6,600	6,000
TOTAL	14,130	11,850
(2) Phthalic anhydride—		
(a) Under B.C.I. project	1,500	1,350
(b) Organic chemicals scheme of West Bengal Government at Durgapur	6,600	6,000
TOTAL	8,100	7,350
(3) Benzene—		
Existing capacity at Bhilai, Rourkela & Durgapur steel works	36,000	32,000
(4) Naphthalene—		
Existing capacity at Bhilai, Rourkela and Durgapur steel works.	12,000	11,000

Schemes licensed in the private sector—(a) *Rubber Chemicals.*—M/s. Alkali & Chemical Corporation of India have been licensed in 1959 to undertake the manufacture of a wide range of organic fine chemicals required by the rubber goods manufacturing industries. The scheme which is estimated to involve an investment of Rs. 1·0 crore and begin operations by 1963 is based on the following manufacturing programme :

	Annual capacity
(*i*) Accelerators covering—	
Mercaptobenzthiazole and its derivatives, substituted guanidines, thioureas, thicamines; salts & esters of alkyl dithiocarbanic acid, alkyl thiuram mon and disulphides such as Vulcafor M.B.T., M.B.T.S., H.B.S.	800-1,000 tons
(*ii*) Anti-oxidants—	
N-aryland N-alkyl, aryl amines, styrenated phenols, thiophenols and thionaphthols, aldehyde/amine condensates	1,000-1,200 tons
(*iii*) Retarders—	
Diphenylamine derivatives such as Vulcatard A	100-125 tons
Total production within the capacity licensed	2,250 tons

The scheme provides for the manufacture of some of the semi-products required as intermediates for the output of finished chemicals as planned. These semi-products are carbondisulphide, diphenylamine and cyanogen chloride. The B.C.I. project is expected to provide the primary raw materials, p-naphthol and aniline.

(b) *Synthetic Rubber.*—A major complex for the production of the two organic chemicals—butadiene and styrene—as intermediates for the production of synthetic rubber has been licensed for establishment by M/s. Synthetics & Chemicals Ltd., at Bareilly in Uttar Pradesh in collaboration with Messrs. Firestone of U.S.A. The annual capacity for butadiene under this plant will be 16,800 tons and for styrene 9,000 tons in the first stage of manufacture of SBR rubber at the rate of 20,000 tons per year. Basic designs of the plants are to be undertaken for an annual production of 30,000 tons of SBR rubber even to start with. Whether the expansion of this plant from 20,000 tons to 30,000 tons stage will be in terms of SBR rubber or the new polybutadiene (Diene) rubber would be settled at the appropriate stage in the course of the implementation of this project. Some amount of styrene is expected to be available for outside sale even when the plant operates at the capacity of 30,000 tons of synthetic rubber per year.

Production of butadiene and styrene has been planned on the basis of alcohol and benzene. This major spillover project from the Second Plan is expected to go into production by the end of 1962.

(c) *Acetic Acid.*—Viewed against the existing capacity of about 3,220 tons the estimated requirements by 1965-66 would call for a very steep expansion of acetic acid production over the next five years. The schemes licensed for implementation are given below:

Existing capacity:

M/s. Sirsilk Ltd., Sirpur, Khagaznagar (captive plant)	2,742 tons.
M/s. Mysore Iron & Steel Works, Bhadravati .	480 ,,
M/s. Union Carbide, Trombay (Since July, 61)	1,500 tons (mostly for captive use).

Schemes licensed for implemention:

M/s. Godavari Sugar Mills, Sakarwadi . .	1,872 tons.
M/s. Hyderabad Construction Company, Hyderabad	1,680 tons.
M/s. Andhra Sugars, Tanuku	1,800 tons (including acetic anhydride).
M/s. Kolhapur Sugar Mills, Kolhapur . .	1,800 tons (including part captive consumption).
M/s. Indian Organic Chemicals, Khopoli, Maharashtra	3,000 tons.

Capacity to be intalled for captive use in Cellulose Acetate production:

M/s. Mysore Sugar Co., Mandya	3,000 tons approx.
M/s. Sundatta Foods & Fibres	2,000 tons approx.
M/s. Modi Spinning & Weaving Mills, Yamunanagar (Punjab)	2,000 tons approx.
M/s. East Anglia Plastics, Vizagapatam	1,500 tons approx

A proportion of acetic acid can be expected to be developed in captive plants along with cellulose acetate filament, resins and moulding powder manufacture.

(d) *Carbon disulphide.*—The market demands for carbon disulphide are small and almost the entire tonnage of domestic output of this chemical will be accounted for by the rayon and staple fibre (viscose) industry.

(e) *Phenol & phthalic anhydride.*—An industrial licence has been issued to Messrs. Nowrosjee Wadia & Sons Ltd., for the establishment of production facilities for phenol and phthalic anhydride. This licence also covers the manufacture of cumene, the intermediary raw material for phenol production from benzene-propylene; acetone a co-product of phenol production by the cumene process as well as diacetone alcohol. The details relating to the capacities envisaged for installation in the Bombay area under this scheme as on 1st April 1961 were as under:

(In tons)

	Initially	Subsequently
Phenol	10,000	15,000
Cumene (from benzene-propylene)	14,500	22,000
Acetone (co-product)	6,000	9,000
Diacetone alcohol	2,000	5,000
Phthalic anhydride	3,000	10,000

Requirements of additional capacity to be installed under the Third Plan.—Against the background of the estimated requirements by 1965-66, the developments in the public sector and the schemes licensed in the private sector discussed above, the limits and scope for further licensing and installation of additional capacity would appear to be as follows:

(a) *Phenol & phthalic anhydride.*—The capacity cleared so far for implementation is in excess of the provisional target set for these two items under the Third Plan. It is also in excess of the demands as estimated which can readily be taken care of if the provisional targets are fully implemented. In the case of phthalic anhydride, even if the target for P.V.C. plastics, which are the major consumers of the phthalate plasticizers, were doubled, the

requirements of phthalic anhydride can be met on the basis of the achievement of the provisional targets. On the other hand, the need for some measure of expansion of production of these items under the BCI project of the Central Government might arise in order to bring the production capacity of phenol and phthalic anhydride plants under it to a more economic level. These considerations emphasise the importance of an integrated view on all the projects and phasing the production under these items after the firm time schedules for the implementation of the various projects are available rather than the licensing of any further capacity for implementation within the Third Plan period.

(b) *Methanol.*—As against the requirements of methanol estimated at 21,500 tons by 1965-66, no unit has been projected so far. A plant of about 100 tons daily capacity if installed during the Third Plan period, can fully take care of the growth of demand for methanol as has been forecast. Centralisation of production facilities would, on the other hand, involve heavy transportation costs and adversely affect the organic chemicals production based on methanol planned to be organised in centres far away from the location of such a methanol plant. The balance of advantage might therefore lie in favour of organising two centres of methanol production in proximity to areas where the consuming industries are concentrated. Even so, the construction of a second plant need be considered only in the last year of the plan period and the capacity target for the Third Plan could be visualised at about 25,000—30,000 tons per year. A phasing of this nature is called for on account of the heavy foreign exchange expenditure involved in constructing methanol plants.

(c) *Benzene & Naphthalene.*—The position relating to the installed capacity for the production of these two aromatic hydrocarbons at the end of the Second Plan and the potential for stepping up the capacity further during the Third Plan on the basis of extending the recovery of benzol and its rectification *pari passu* with the building up of additional coal carbonisation capacity in conjunction with iron and steel production has been dealt with under section (C) of the Coal Carbonisation Industry in this volume. Based on the appreciation of benzene and napthalene supplies from these bye-product sources, it would seem possible that the requirements by 1965-66 could be met in full if the necessary extensions are carried out at the steel plants. On economic consideration and to avoid transport problems, it would be desirable for the growth of chemical industries dependant on benzene to take place near the steel plants. For the chemical industries in Western India, benzene may be provided by developing nearby sources *viz.*, petroleum refineries and naphtha cracking plants.

The overall targets for benzene and napthalene for 1965-66 are envisaged as follows:

('000 tons)

	Capacity	Production
Benzene	60	52
Naphthalene	17·5	15·5

(d) *Aliphatic hydrocarbons.*—As already explained, the two aliphatic hydro-carbons, whose consumption as industrial raw material has been developed in conjunction with the production of polyethylene and polyvinyl chloride under the Second Plan, are ethylene and acetylene. Plans have also been formulated for the use of ethylene in styrene production under the synthetic rubber project referred to earlier and in two other styrene monomer plants at Bombay and Vizagapatam which have been licensed. Industrial alcohol and calcium carbide have been made the basis for the production of these hydrocarbons. In conjunction with new developments in the field of plastics and some of the synthetic organic chemicals projected in the Bombay area which have been approved for implementation since the latter half of 1959, the supplies of ethylene are proposed to be derived from the cracking of petroleum naptha. Licences have been issued for the installation of a captive naptha cracker of 60,000 tons annual capacity by M/s. Union Carbide and of an independent naptha cracker of one lakh tons annual capacity by M/s. Standard Vaccum Oil Company for the production of the different hydrocarbons and sale in the case of the latter to chemical industries for further processing. Crackers of the size approved hitherto do not provide for the efficient recovery of the C_4 fractions which are valuable starting materials for the production of the latest varieties of synthetic rubbers.

Against this background the installation of centralised naptha cracking facilities under plants of two to three lakh tons annual capacity have attracted considerable interest. While they will have the significant advantage of a lower investment cost, their actual operations may have to be pegged to lower levels of output and utilisation of the aliphatics until the levels of production in related fields like plastics, synthetic fibres and detergents are increased in due course of time.

Miscellaneous.—In connection with the development of the organic chemicals, careful attention would have to be given to the following aspects :

(a) Formulation of specifications to facilitate the manufacture of products of acceptable quality and in conformity with the requirements for specific end-uses ;

(b) Satisfactory arrangements for treatment and disposal of effluents from the plants engaged in the manufacture of primary intermediates and finished products ;

(c) Adequate measures inside the factories to safeguard against fire and explosion hazards and ensure the safety of workers from the various kinds of occupational hazards, associated with these industries ;

(d) Planning of railway transport from the point of view of development of special types of wagon facilities demanded by these industries for movement of raw materials and the finished products.

The following table summarises the programme of development for some specific organic chemicals in the Third Plan :

(In tons)

	1960		1965-66	
	Capacity	Production	Capacity	Production
Carbon disulphide . . .	N.A.	N.A.	50,000	45,000
Acetic acid	3,220	3,038	31,000	28,000
Methanol	60	15·2	25,000 to 30,000	21,500
Benzene	8,358	1,179	68,000	52,000
Naphthalene	588	588	17,500	15,500
Phenol by-product & Synthetic .	Nil	Nil	16,000	14,300
Phthalic anhydride . . .	Nil	Nil	15,000	10,000
Synthetic rubber . . .	Nil	Nil	50,000	50,000
Rubber chemicals . . .	Nil	Nil	3,000	3,000

46. DYESTUFFS & INTERMEDIATES

A. Dyestuffs

1. Review of Progress in the Second Plan :

Targets.—The targets for capacity and production of dyestuffs were envisaged at 27 million lbs. and 22 million lbs. by 1960-61. Within these overall targets, the lines of diversification and levels of production of different groups of dyes were recommended as follows in the Development Programme for this industry in the Second Plan :

(a) Azo Dyes: The capacity established or under implementation was adequate for meeting the demand for ordinary types of azo dyes. Production of the following categories of azo dyes had to be developed :

(i) cyanurated azo dyes (chlorantine types),

(ii) urea derivatives of monoazo & diazo dyestuffs (siruius supra type).

(iii) mordent azo dyes,

(iv) metalised acid dyes.

(b) Basic dyes : There was no capacity established or under implementation for this category of dyestuffs. Capacity of the order of 750,000 lbs. per annum should be developed.

(c) Naphthols : Capacity approved for establishment till the end of the First Plan did not cover the entire range of naphthols. Production of naphthols AS-RL; AS-LT; AS-BG; AS-E; AS-BR; AS-GR; AS-JB; AS-SB and AS-SR was recommended to be fostered in this connection.

(d) Indigo : There was no capacity established or under implementation for indigo. The demand of 500,000 lbs. per annum was to be met by setting up new capacity of the same order.

(e) Vat Dyes : Facilities for the producton of vat yellows, vat browns, vat oranges and carbazol blue were to be provided. For this purpose additional capacity of the order of 2 to 2·5 million lbs. for new vats was to be brought into existence.

(f) Sulphur Dyes: Adequate provision for the production of sulphur black had already been made. Further expansion of this sector of the industry had to be directed to securing facilities for the production of sulphur brown, sulphur blue, sulphur green and indo-carbon CL.

The dyestuff targets proposed for 1960-61 at the time of the formulation of the Second Plan in 1956 were based on the figures for vat dyes related to single standard strength. This basis was altered later on and the capacity and output of vat dyes have begun to be reckoned in terms of the concentration of these dyestuffs as marketed. With this change in computation, the revised overall targets for 1960-61 would have to be vasualised as: capacity 15·2 million lbs. and production 12·4 millions lbs.

Capacity.—Considerable progress has been recorded in building up new capacity during the Second Plan period. Between 1956 and 1961, 5 new units were established and 6 existing establishments expanded. Facilities for additional production of dyestuffs are being created and an equal number of existing enterprises undertook the production of new ranges and groups of dyes by diversification and expansion. M/s. Atul Products Ltd. and its sister concern M/s. Atic Industries Ltd. maintained their dominant position in the dyestuffs field. Their turn over of dyestuffs expanded from about Rs. 0·90 crore in 1955 to approximately Rs. 6·2 crores in 1960. A turn over level in excess of Rs. 1 crore each has been achieved by M/s. Indian Dyestuff Industries Ltd. and M/s. Amar Dye-Chem. Ltd. Quite recently some expansion schemes were put into operation for the production of organic pigments and printing pigment emulsions for textile printing.

Apart from the large & medium scale enterprises, there are some small processing plants in operation in the dyestuffs field. In view of the importance of quality, production cost of dyestuffs, hazards involved in handling the dyes intermediates etc. the field of operation of the small units has to be clearly defined and demarcated. This question is engaging the attention of the Dyestuffs Panel.

Almost the entire capacity of the dyestuff industry is concentrated in Maharashtra and Gujarat States as would be seen from the statement below which indicates the capacity of the various units at the beginning and the end of the Second Plan. The installed capacity expanded from 3,241 tons as on 1st April, 1956 to 7,613 tons as on 1st April, 1961.

(tons)

Dye-Group	Name of the unit	Installed capacity as on 1-4-56	Installed capacity as on 1-4-61
1	2	3	4
Acid & Direct Dyes	M/s. Aniline Dyestuff & Pharmaceutical Ltd., Bombay	..	45
	M/s. ARLABS (P) Ltd., Bombay	..	48
	M/s. Atul Products Ltd., Bulsar	1,100	1,100
	M/s. India Chemical Industries, Amritsar	69	235
	TOTAL	1,169	1,428
Basic Dyes	M/s. Associated Rubber & Chemical Industries, Poona	..	27
	M/s. United Dye-Chem. Industries (P) Ltd., Bombay	..	25
	TOTAL	..	52

(tons)

1	2	3	4
Naphthols	M/s. Amar Dye-Chem. Ltd., Bombay	..	650
	M/s. Atul Products Ltd., Bulsar.	..	300
	M/s. National Chemical Industries, Delhi	..	100
	TOTAL	..	1,050
Fast-Colour Bases	M/s. Amar Dye-Chem. Ltd., Bombay	..	650
	M/s. National Chemical Industries, Delhi	..	100
	TOTAL	..	750
Vat Dyes	M/s. Indian Dye-stuff Industries Ltd.	..	220
	M/s. Atic Industries Ltd., Bulsar	..	
	TOTAL	..	477
Sulphur Black	M/s. Hicksen & Dada jee (P) Ltd., Bombay	450	900
	M/s. Atul Products Ltd., Bulsar	900	900
	TOTAL	1,350	1,800
Solubilized Vats.	M/s. ARLABS (P) Ltd., Bombay	145	145
	M/s. Atic Industries Ltd., Bulsar	..	33
	M/s. National Chemical Industries, Delhi	24	24
	TOTAL	169	202
Rapid Fast & Rapidogenous.	M/s. ARLABS (P) Ltd., Bombay	109	109
	M/s. Atul Products Ltd., Bulsar	67	67
	M/s. National Chem. Industries, Delhi	162	162
	TOTAL	338	338
Fast Colour Salts	M/s. ARLABS (P) Ltd., Bombay	82	82
	M/s. Atual Products Ltd., Bulsar	133	133
	TOTAL	215	215
Optical Bleaching Agents.	M/s. Hicksen & Dadajee Ltd., Bombay	..	45
	M/s. Amar Dye-Chem. Ltd., Bombay	..	50
	M/s. Sandoz (I) Ltd., Bombay	..	32
	M/s. Suhrid Geigy Ltd.	..	67
	TOTAL	..	194
Organic Pigments	M/s. Sudarshan Chemical Industries Ltd., Poona	..	180
	M/s. ARLABS (P) Ltd., Bombay	..	38
	M/s. Colour Chemical Ltd., Bombay	..	285
	TOTAL	..	503
Printing Pigment Emulsions.	M/s. Colour-Chem Ltd., Bombay	..	604
	TOTAL	..	604

The State-wise distribution of annual capacities is given below :

(tons)

State	As on 1-4-56	As on 1-4-61
Maharashtra	786	4,135
Gujarat	2,200	2,857
Delhi	186	386
Punjab	69	235
TOTAL	3,241	7,613

Production.—The progress of production of dyestuffs in five years of the Second Plan period is indicated in terms of different groups of dyestuffs in the statement below and described briefly in the following paragraphs.

('000 lbs.)

Dye-stuffs	1956	1957	1958	1959	1960
Azo Dyes	1,772	2,162	1,872	2,720	2,616
Fast Colour Bases	4	222	356	860	998
Fast Colour Salts	334	272	289	280	476
Ink Blue & Methylene Blue	8	10	32	60	110
Naphthols	188	1,285	998	1,630	1,695
Optical Bleaching Agents	8	77	180	280	364
Solubilised vats	101	111	142	172	231
Stabilised Azoics	483	521	594	639	*
Sulphur Black	3,461	3,000	1,858	3,030	3,280
Vat Dyes (Commercial strength)	46	263	416	720	1,045
Printing Pigment Emulsions	..	..	..	92	406
Organic Pigments	..	..	..	135	572
TOTAL	6,403	8,732	6,737	10,618	11,993

*Production is included in item No. 3, *i.e.* fast colour salts.

Basic Dyes.—Progress in this field has not been very satisfactory as compared to the Plan expectations. Production of ink blue and methylene blue expanded from 6,000 lbs. to 110,150 lbs. between 1956 and 1960 whereas it was suggested that capacity of 750,000 lbs. should be developed by 1961. In 1959 five schemes were approved for 23 different items of basic dyes with a capacity of 2.4 million lbs. per year.

Naphthols.—Actual production of naphthols commenced only towards the end of 1956. The output during 1960 was 1·9 million lbs. The naphthols at present manufactured are : Naphthol AS, AS-BS, AS-D, AS-PH, AS-OL, AS-BO, AS-SOW, AS-TR, AS-G, AS-SG, AS-BR, AS-E, AS-RL.

Fast Colour Bases.—Actual production commenced only towards the end of 1956. The output during 1960 was 0·998 million lbs. The Fast Colour Bases at present manufactured are : Fast Blue BB Base, Fast Bordeaux GP Base, Fast Yellow RC Base, Fast Orange G/GC

Base, Fast Red KB Base, Fast Scarlet R/RC Base, Fast Red R/RC Base, Fast Red B Base, Fast Red GC Base, Fast Scarlet G Base, Fast Scarlet GG/GGS Base, Fast Garnet GS/GBC Base.

Azo Dyes.—Production of azo dyes increased by about 15% between 1956 and 1960. The expectation that chlorantine and sirius supra types of azo dyes and mordant azo dyes and metallised azo types would be produced by the end of the Second Plan has not been realised; but schemes have been approved for their development.

Indigo.—No capacity has been licensed for establishment for the production of indigo so far.

Vat Dyes.—During the First Plan there was no production of this type of dyes. Production commenced only in the middle of 1956. The output during 1960 was 1·04 million lbs. Vat dyes at present manufactured are Vat Jade Green B/FFB, Vat Jade Green 2G, Vat Jade Green 4G, Vat Jade Green 3B, Vat Blue RSN, Vat Blue BC, Vat Blue GCD, Vat Dark Blue RCL, Vat Black BB, Vat Direct Black 2R, Vat Violet 2R, Vat 4R, Vat Magenta B, Vat Brown RRD, Vat Direct Black RB.

Sulphur Dyes.—The production of sulphur black was maintained above the level of 3·0 millions lbs. in each year with the exception of 1958 when it went down to 1·86 million lbs. Licences have been given for the manufacture of other sulphur dyes which are in process of implementation. By and large, the progress recorded by the dyestuff industry is satisfactory having regard to its infant status at the beginning of the Second Plan. The value of output rose from Rs. 1·7 crores in 1955 to Rs. 12 crores in 1960, and the indigenous content of the dyestuffs from 50% to 65% on average.

Details of foreign collaboration.—The indigenous manufacturers have entered into technical collaboration arrangements with dyestuffs producers abroad. The position in this regard is shown below:

Indian Manufacturer	Foreign firms providing technical collaboration.
M/s. Atual Products Ltd., Bulsar	M/s. American Cyanamid Co. Inc. U.S.A.
M/s. Atul Products Ltd., Bulsar	M/s. CIBA Ltd., Basle.
M/s. Atic Industries Ltd., Bulsar	M/s. Imperial Chemical Industries Ltd., U.K.
M/s. Amar Dye-Chem. Ltd., Bombay	M/s. A.C.N.A., Italy.
M/s. Indian Dyestuff Industries Ltd., Bombay.	M/s. A. C. N.A., Italy.
M/s. Suhrid Geigy Ltd., Baroda	M/s. Geigy Ltd., Basle.
M/s. Hickson & Dadajee Ltd., Bombay	M/s. Hickson & Welch Ltd., U.K.
M/s. Colour Chem. Ltd., Bombay	M/s. Pareen Vabrikan & M/s. Hoechst of West Germany.
M/s. Sandoz (India) Ltd., Bombay	M/s. Sandoz, Basle.

Research, Testing and Standardisation.—The Council of Scientific and Industrial Research approved the setting up of Dyes and Intermediates Research Division in the National Chemical Laboratory, Poona, to take up research work on dyes and intermediates, to evolve new types of dyes and formulations and to develop new economical processes for the manufacture of existing types of dyes. The Division is being organised. It is expected that the Division will start functioning in the beginning of the Third Plan. The fundamental research will be conducted by the Division on its own but the applied research will have to be conducted in cooperation with the industry.

The Indian Standards Institution (ISI) has already started the work of standardising the food colours. The ISI proposes to take up the standardization of intermediates shortly. Intermediates will be selected by priority basis for the formulation of specifications. Discussions are still going on the standardisation work of other dyestuffs.

Imports.—The quantity and value of imports of different dyestuffs since 1956-57 is indicated in the following statement:

	Coal Tar Dyestuffs and Natural Indigo		Naphthols and Others	
	Quantity '000 lbs.	Value in Rs. lakhs	Quantity cwts.	Value in Rs. lakhs
1956-57	10,611	1,217	N.A.	N.A.
1957	9,947	1,089	16,515	225
1958	6,359	670	10,532	144
1959	5,854	714	11,825	113
1960	6,612	906	17,077	141

Imports of coal tar dyes showed a downward trend during the Second Five-Year Plan, specially during the years 1958 and 1959. This is due to the progress in the indigenous production of dyes which was only in the initial stages in 1956. The imports again went up during 1960 due to the increased demand of dyestuffs in the country.

Problems of the Industry.—The indigenous manufacturers of dyestuffs were facing severe competition from imports on account of the relatively low import duties on finished dyes as compared to the raw materials which consisted of complex intermediates and penultimates of organic origin. This impeded the development of dyestuff industry during the First Plan. Appropriate measures to protect the industry were taken up by the Government of India on the basis of the Tariff Commission's recommendation early in 1955. Thereby the industry was protected for 10 years and the import duties on certain finished dyestuffs were raised and those on specific intermediates were reduced. The modification of the import tariff structure has assisted the growth of indigenous industry. The Tariff Commission is currently reviewing the position of the industry.

Investment.—The investment in the dyestuff industry during the Second Five-Year Plan has been estimated at Rs. 7 crores. This does not include the investments on the N.I.D.C. scheme for intermediates manufacture.

II. Programme of Development in the Third Plan :

Estimated Requirements.—The question of dyestuffs requirements by 1965-66 was gone into by the Development Council for Drugs, Dyestuffs and Intermediates. In formulating the demand estimate, the Council reviewed the progress of various industries using dyestuffs during the Second Plan and their programmes of development for the Third Five Year Plan.

Textile industry is the major consumer of dyestuffs. The targets for production for textiles are as under :

Item	Unit	Production 1955-56	Production 1965-66
Cotton Textiles	Million yds	6,600	9,300
Woollen Cloth	,,	15	35
Rayon Filament and staple fibre.	Million lbs.	30	215

The percentage increase of targets of 1965-66 over the targets of 1955-56 for textile is about 40 to 45. There are other sectors which are relatively less important from the point of view of consumption of dyestuffs *e.g.* plastics, rubber, soap, drugs and leather etc. though the development proposed under them is considerable. Taking all these factors as well as changes in the pattern of demand for dyestuffs, *inter se*, into consideration the Sub-Committee of the Development Council on Drugs, Dyestuffs and Intermediates assessed the increase in demand of various items of dyestuffs as follows :

1. *Acid & Direct Dyes.*—The requirements will be approximately 50% more than the requirements for 1955.
2. *Basic Dyes.*—The estimate of requirements will be approximately 50% more than the requirements estimated for 1955.
3. *Naphthols & Fast Colour Bases.*—The Sub-Committee was of the view that the demand for naphthols and fast colour bases has been rising considerably and therefore the requirements of these materials should be increased by 100% over the estimated consumption in 1955.
4. *Vat Dyes.*—There is likely to be greater demand for vat dyes and hence the targets of requirements should be raised by 66% over the estimated requirements for 1955.
5. *Sulphur Black.*—The requirements of this material are likely to rise normally and be of the order of 50% over the estimated requirements for 1955 by the last year of the Third Plan.

Based on the above assumption of this Sub-Committee, the Council formulated the requirements of dye-stuffs for the year 1965-66 as under :

Dye-stuff	Demand in 1955	'000 lbs. Estimated requirement by 1965-66
Acid & direct dyes	3,200	4,800
Naphthols	1,250	2,500
Fast colour bases	1,250	2,500
Vat dyes	1,600	2,500
Sulphur black	2,800	4,000
Solubilised vats, Stabilised azoics, Fast colour salts	These are processed dyes. Their requirements are covered under the estimate for vat dyes, naphthols and fast colour bases.	
Printing pigment emultion, Organic pigments	These are new lines. Demand has to develop.	
Basic dyes	800	1,200
Other sulphur dyes	300	400
TOTAL	11200	17900*
	Roughly 18 million lbs.	

Targets for the Third Plan.—Substantial expansion is being envisaged in the production of dyestuffs during the Third Five Year Plan and the targets for capacity and production for 1965-66 have been recommended at 25 and 21·2 million lbs. These targets include organic pigments whose requirements have not been covered within the demand estimate of 18 million lbs. but would nevertheless have to be met from out of indigenous production. To the maximum extent possible, domestic requirements are expected to be met by diversification of production. Even so it is expected that there would be certain categories of dyestuffs to be imported in 1965-66 and these are valued at about Rs. 2·5 to 3·0 crores. As against this, it is envisaged that under the stimulus of the incentives and reduction in cost through increased scale of operation, Indian made dyes would be exported and a balance may be nearly achieved between imports and exports in terms of value.

*This does not include the demand for organic pigments and printing pigment emulsions.

Schemes approved for Implementation.—Reference has been made in the review of progress of the dyestuff industry under the Second Plan to schemes approved for implementation for the production of new items of dyestuffs. The details of the approved schemes are :

Dye Group	Name of the firm	Additional capacity licensed (tons/year)
1	2	3
Acid & Direct Dyes . .	M/s. Atul Products Ltd., Bulsar . .	300
	M/s. K.C.A. (P) Ltd., Jamnagar . .	740
	M/s. IDCO Dyestuffs, Delhi . .	307
	M/s. Aniline Dyestuff & Pharmaceuticals Works, Bombay.	65
	M/s. United Dye-Chem Industries Ltd., Bombay.	35
	M/s. Pigment & Dyestuff Ltd., Bombay	48
	M/s. Suhrid Geigy Ltd., Bombay .	193
	M/s. Sandoz (India) Ltd., Bombay .	387
	TOTAL .	2,475
Basic Dyes	M/s. Amar Dye-Chem Ltd., Bombay .	500
	M/s. Associated Rubber & Chemical Industries, Poona.	166
	M/s. United Dye-Chem Industries Ltd., Bombay.	285
	M/s. Pigment & Dyestuff Ltd., Bombay	84
	M/s. Aniline Dyestuff & Pharmaceutical Ltd., Bombay.	30
	TOTAL .	1,065
Naphthols	M/s. Atul Products Ltd., Bulsar . .	200
	TOTAL .	200
Fast Colour Bases . .	M/s. Atul Products Ltd., Bulsar . .	500
	TOTAL .	500
Sulphur Black . . .	M/s. Atul Products Ltd., Bulsar . .	450
	TOTAL .	450
Sulphur dyes other than sulphur black.	M/s. Atul Products Ltd., Bulsar . .	225
	TOTAL .	225

1	2	3
Vat Dyes	M/s. Indian Dyestuff Industries, Ltd., Bombay.	280
	M/s. United Dyestuff Industries Ltd., Bombay.	138
	M/s. Trianthrene Dyes, Drugs and Organics Ltd., Bombay.	150
	M/s. Narayandas Pramananddas, Calcutta.	62
	M/s. ARLABS (P) Ltd., Bombay	156
	M/s. Aniline Dyestuff & Pharmaceuticals Ltd., Bombay.	10
	TOTAL	796
Organic Pigments	M/s. Colour-Chem Ltd., Bombay	100
	M/s. Sudarshan Chemical Industries Ltd., Poona.	120
	M/s. Pigment & Dyestuffs Ltd., Bombay.	120
	M/s. Atul Products Ltd., Bulsar	300
	M/s. Suhrid Geigy Ltd., Baroda	207
	TOTAL	847
Pigment emulsion	M/s. Sandoz (India) Ltd., Bombay	137
	TOTAL	137
Optical Bleaching Agents	M/s. Atul Products Ltd., Bulsar	100
	M/s. Suhrid Geigy Ltd., Baroda	51
	M/s. United Dyestuff Industries Ltd., Ahmedabad.	30
	TOTAL	181
Food Colour	M/s. Hicksen & Dadajee Ltd., Bombay	109
	M/s. K.C.A. (P) Ltd., Jamnagar	100
	TOTAL	209
Reactive Dyes	M/s. Amar Dye-Chem Ltd., Bombay	250
	TOTAL	250
Acetate Dyes	M/s. K.C.A. (P) Ltd., Jamnangar	25
	M/s. Aniline Dyestuffs & Pharmaceuticals (P) Ltd., Bombay.	10
	TOTAL	35
Alcian Dyes	M/s. Chemicals & Fibres of India Ltd., Panvel.	165
	TOTAL	165

It may be pointed out that some of the schemes have been licensed on the basis that would involve no entitlement to cash releases of foreign exchange for import of raw materials and it remains to be seen how far they would be successfully implementing the schemes. It is also expected that the manufacture of complex intermediates and penultimates products by the indigenous dye-stuff industry would be linked mainly with the organic intermediates planned for manufacture at the basic chemicals and intermediates Plant of the Central Government. Assuming full implementation of schemes licensed, the capacity will be established by the end of Third Plan as shown below :

(In '000 lbs.)

	Capacity expected by 1965-66	Production expected by 1965-66
Acid & direct dyes	6,600	5,500
Basic dyes	2,000	1,800
Naphthols	2,800	2,500
Fast colour bases	2,800	2,500
Vat dyes	2,700	2,500
Sulphur black	5,000	4,000
Organic pigments	2,600	2,000
Other sulphur dyes	500	400
TOTAL	25,000	21,200

Additional Capacity vis-a-vis targets.—Though it might appear from the position relating to capacity set forth above that there would be no gaps requiring to be filled, in actual fact there would be certain categories of dyestuffs whose production has still to be developed, for example, indigo. Provided the demand for such items left out of schemes so far approved is sizeable to facilitate production on a viable basis, plans for covering the gaps should be formulated and implemented in the next five years. Another task for growth envisaged under this industry along with manufacturing programme for organic intermediates discussed below is that the indigenous content should be stepped up to 90% by 1965-66 as compared to the current average level of 65%.

Capital Investment and Employment.—In the private sector, investment is required for creating additional capacity for finished dyes and also for expanding the manufacture of complex intermediates to link production with the primary intermediates, covered in the N.I.D.C. scheme. Also the bigger units have to provide themselves with facilities for the production of a number of inorganic chemicals such as sulphuric acid, caustic soda, chlorine, potassium hydroxide etc. Total estimated investment on Dye-stuffs and intermediates during the Third Five Year Plan will be Rs. 28·0 crores including Rs. 13·0 crores as foreign exchange component.

The additional employment in the industry on the basis of production targets recommended will be for 3,000 persons.

B. Organic Intermediates, Primary and Complex

1. Review of Progress in the Second Plan :

The manufacture of primary organic intermediates and their further processing into the specific raw materials for the dyestuff industry normally called complex intermediates, is an important stage of expansion calculated to link this industry with the preliminary raw materials, mostly indigenous. By this process, the dye-stuff industry becomes truely indigenous and assured of continued operation even in emergencies when supplies of imported raw materials are in jeopardy. Valuable knowhow is also gained in a highly complicated field of organic chemicals through these developments. In view of these considerations, a scheme for the manufacture of intermediates was envisaged in the Second Plan and its development was entrusted to the N.I.D.C. as a public sector project. Though the full details of the project were not available in 1956, the Second Plan envisaged that the N.I.D.C. should plan for the centralised production of the organic intermediates required for dye-stuffs, drugs and plastics industry and indicated a broad list of intermediates projected for manufacture.

The processing of the N.I.D.C. intermediates project was taken in hand early in Second Plan. A team of experts from Montecatini of Italy undertook a survey in 1956 at the instance of the N.I.D.C. and estimated the requirements of intermediates *viz-a-viz* the anticipated demand for dyestuff by the end of decade *i.e.* by 1965. Taking into account the data supplied by Government about the requirements of intermediates for drugs, plastics and other industries, and overall demand picture for organic intermediates was built up and project report prepared for developing their production. Similar studies were undertaken independently by the I.C.I., West German Consortium and group of Indian technologists. In the course of further explorations for implementing this project, an offer of foreign exchange credit was made by the Bayers Consortium in 1958 and Government decided to go ahead in collaboration with this West German group which is also a leading producer of dyestuff in the world. Towards the end of 1959, Government set up the Drug Project Location Committee to recommend, *inter alia*, the location for the Basic Chemicals and Intermediates (B.C.I) Project on the basis of a broad indication of the locational requirements given by the collaborators. The Committee submitted its report to Government in July, 1960.

After considering the report, Government took the decision to locate the B.C.I. plant in the Apta village area near Panvel in Maharashtra. By the end of Second Plan, detailed data bearing on site conditions was collected and an agreement has been signed with a group of 4 German firms (Bayers, Hoechst, B.A.S.F. and Fredric Uhde) for the construction and operation of the factory.

The progress on the N.I.D.C. intermediate project has been delayed on account of the time taken in defining the scope of the project and other preliminaries as well as concluding the negotiations with the Bayers Consortium in regard to the technical and financial collaboration.

11. Programme of Development in the Third Plan:

Estimated Requirements.—In relation to the targets for dye-stuff set for 1965-66 the Dye stuffs Panel of the Development Council for Organic Chemicals has estimated the consumption requirements of intermediates as indicated in the following statement. The figures include the total requirements of each product, *e.g.* the figures given for nitrobenzene include the requirement for aniline.

Raw Material	Estimates of 1965-66 requirements (tons)
Nitrobenzene	3,453
Aniline	1,348
Chlorobenzene	3,013
O-dichlorobenzene	45
P-dichlorobenzene	276
Phenol	344
O-nitrochlorobenzene	749
P-nitrochlorobenzene	328
M-nitrochlorobenzene	90
Dinitrochlorobenzene	1,518
Dinitrobenzene	252
Metanilic acid	293
2,5 dichloronitrobenzene	333
O-nitroanisole	605
O-anisidine	337
P-anisidine	91
P-nitroanisole	120
4-chloro-2-nitroanisole	192
Dimethylaniline	574
Acetanilide	10
Salicylic acid	48
O-chloroaniline	29
P-chloroaniline	6
2,5 Dichloroaniline	5
O-nitrotoluene	772
M-nitrotoluene	1
P-nitrotoluene	642
O-toluidine	416
M-toluidine	1

Raw Material	Estimates of 1965-66 requirements (tons)
P-toluidine	403
Dinitrostilbene disulphonic acid	123
Diaminostilbene disulphonic acid	95
Dinitrotoluene	99
P-nitrotoluene sulphonic acid	159
Beeta naphthol	1,580
Phthalic anhydride	2,937
Anthraquinone	2,205
Benzene	6,848
Naphthalene	5,845
Toluene	2,862
Xylene	206

Schemes under implementation

Public sector project.—As already explained, the manufacturing programme under the BCI project at Apta Kharapada (Maharashtra State) is based on meeting the raw material requirements of dyestuffs, drugs, plastics industries and other miscellaneous demands *e.g.* rubber chemicals manufacture. The project would have captive plants for the manufacture of some of the inorganic chemicals *e.g.* sulphuric acid, oleum, nitric acid etc. This major spill-over project from the Second plan is estimated to involve an investment of Rs. 11·0 crores overall and Rs. 6·0 crores by way of foreign exchange under the current plan period and will be run by a company called Hindustan Organic Chemicals Ltd. with an authorised capital of Rs. 12 crores. The manufacturing programme is planned as follows :

Item	Total production planned (tons/Year)	Quantity for sale (tons/ Year)
1	2	3
Anthraquinones	650	650
Phthalic anhydride	1,500	950
B-Naphthol	750	750
O-Nitrotoluene	637	190
M-Nitrotoluene	22	..
P-Nitrotoluene	340	..
O-Nitrochlorobenzene	180	..

1	2	3
P-Nitrochlorobenzene	350	160
Chlorobenzene	3,500	135
O-Dichlorobenzene	415	415
P-Dichlorobenzene	470	370
2-Nitroanisol	350	..
4-Nitroanisol	85	..
4-Chloro-2-Nitroanisol	70	..
Aniline	1,750	820
O-Toluidine	320	320
M-Toluidine	15	15
P-Toludine	165	165
O-Anisidine	240	240
P-Anisidine	60	60
O-Chloroaniline	40	40
P-Chloroaniline	60	60
4-Chloro-2-anisidine	50	50
2-5- Dichloroaniline	20	20
M-Nitrochlorobenzene	100	..
M-Chloroaniline	70	70
Dimethylaniline	250	250
Acetanilide	1,000	1,000
Acetylsalicylic acid	150	150
M-Amino phenol	250	..
Salicylic acid	300	150
P-Amino saliyclic acid, sodium salt	200	200
M-Nitrobenzene sulphonic acid	850	90
P.-Nitrotoluene sulphonic acid	90	..
Dinitrostilbene disulphonic acid	72	..
Nitrobenzene	3,500	..
Nitrotoluene, crude	1,100	..
Dinitrobenzene	150	..
Dinitrotoluene	50	..
Dinitrochlorobenzene	1,000	1,000
1-4-Dichlore-2-nitrobenzene	110	..
Nitrochlorobenzene, crude	550	..
Metanilic acid	606	..
Diamin stilbene disulphonic acid	50	50
Phenol	1,500	1,250
Phenyl phenols	100	100
Phenoxy acetic acid	20	20

Projects in the private sector.—Complex intermediates hitherto imported from abroad are planned for production by the dyestuff manufacturers in their efforts to increase the indigenous content of the finished dyes produced. By and large, the NIDC intermediates are intended to be the starting raw materials for the production of complex intermediates. On account of the delay which occurred in the speedy implementation of the NIDC project and the consequent accentuation of the strain on the maintenance foreign exchange bill, the schemes of some of the dyestuff manufacturers to produce organic intermediates, which are on the manufacturing programme of the NIDC project, have been approved. On the other hand, the question of manufacture of some intermediates which are reported to be carcinogenic *e.g.* Benzedene,O-tolidine, Alpha-napthylamine and Beta-naphthylamine is still under study. Some adjustments in the scope and role of the public sector undertaking in this field may be necessary.

Targets and Investment.—The Third Plan envisages the capacity and production targets for organic intermediates in the public sector at 25,000 tons by 1965-66. The investment on the NIDC organic intermediates project during 1961-66 is estimated at Rs. 11·0 crores of which Rs. 6·0 crores will be the foreign exchange component.

47. PHARMACEUTICAL DRUGS & PESTICIDES

1. Review of Progress in the Second Plan:

Targets.—The following targets for production of some of the important essential drugs, broadly at par with the demand estimates for the last year of the Second Plan were envisaged :

Name of the Drug	Unit	Production
1. Penicillin	million mega unit	40
2. Streptomycin	kilograms	18,000
3. Chloramphenicol	,,	10,000
4. Tetracyclines	,,	10,000
5. Sulpha Drugs	,,	450,000
6. P. A. S.	,,	113,300
7. I. N. H.	,,	10,000
8. Procaine Hydrochloride	,,	50,000
9. D. D. T.	tons	2,800
10. B. H. C.	,,	2,500

For certain other important drugs, the demand was estimated to go up to the levels indicated below by the end of Second Plan :

	Demand Estimate for 1960-61 (kilograms)
Vitamin A	6,600
Vitamin B 1	12,000
Vitamin B 2	2,000
Saccharine	30,000
Nikethamide	10,000
Quinine	100,000
Calcium Lactate	200,000
Calcium Gluconate	60,000

The development programme for this industry, while recognising the difficulties connected with planning for self-sufficiency in the drugs field and the inevitability of import of newer drugs, underlined the importance of rapid progress in the manufacture of essential drugs on the basis of a domestic raw material base to be provided by a plant for organic intermediates catering to the needs of other industries as well like dye-stuffs and plastics. It referred to the studies in progress in 1955 into the future pattern and quantum of development of the pharmaceutical industry in India with the help of a team of Russian experts and recommended that a high priority should be accorded to an integrated development of the industry covering the manufacture of as many essential drugs as possible from the basic raw materials.

Developments in the Public Sector.—Higher output of penicillin was made possible in the public sector through the use of improved strains of penicillin moulds in the initial years of the Second Plan. With the completion of the 60% expansion schemes in 1959, the capacity for the production of penicillin at Pimpri has been stepped up to 45 million mega units. The production of 'Bicillin' at Pimpri envisaged in the development programme was given up owing to the limited demand for it and the production of penicillin V was taken in hand.

The development programme referred to the plans of the Hindusthan Anti-biotics to take up the manufacture of certain other antibiotics like streptomycin and an overall allocation of Rs. 1 crore for all expansion programmes was made. In 1959, Government approved the proposal of Hindustan Antibiotics to establish, in technical collaboration with M/s Merck-Sharp & Dhom of U.S.A. a plant for the production of streptomycin with an annual capacity of 40,000 to 45,000 Kgs. and at an estimated cost of Rs. 210 lakhs and also a pilot plant for the production of tetracyclines at the rate of 1·5 tons per year. Both these schemes were under implementation by the end of Second Plan and the gross fixed investment by the Hindustan Antibiotics during 1956-61 which is inclusive of the expenditure on a fully automatic bottling plant of 36 million vials a year amounted to Rs. 1·73 crores.

In the field of insecticides, the developments related to the creation of additional capacity for D.D.T. through the expansion of the D.D.T. factory at Delhi and the establishment of a new unit at Alwaye (Kerala), both of which were completed in 1958. Thereafter the overall annual capacity for D.D.T. remained at 2,800 tons per year as compared to 700 tons in 1956.

In the initial years of the Second Plan considerable thought was given to the lines along which the facilities for the production of essential drugs should be created in the country in a big way. A team of U.S.S.R. experts reported on this question in July 1956. An Indian team studied in U.S.S.R. the Soviet Drug industry from different aspects and made its recommendations to Government . Taking advantage of an offer of 80 million roubles credit for drug projects made by the U.S.S.R. Government in April 1958, Government decided to establish in the public sector, plants for the manufacture of synthetic drugs, antibiotics, surgical instruments, phyto-chemicals and glandular products. Based on further discussion at the expert level with the technicians from U.S.S.R., the scope and content of four of these units to cover the manufacture of these drugs and allied items were defined before the end of the year. As the project for the manufacture of glandular products was dependent on the setting up of modern slaughter houses in the country, its consideration was postponed. Final recommendations regarding appropriate locations for these projects were made by the Drug Projects Location Committee set up by the Planning Commission in April 1959. Before the end of the year, the Central Government took decisions on the locations for the drugs projects as follows :

Synthetic Drug Project	Sanatnagar (Hyderabad), Andhra Pradesh.
Antibiotics Project	Rishikesh (U.P.).
Phyto-Chemicals Project	Nariamangiam (Kerala).
Surgical Instruments Project	Guindy near Madras.

The items proposed for manufacture under the first three projects, the estimated investment and the employment potential are indicated below :

1. *Synthetic Drug Project.*—It is expected to involve an outlay of Rs. 8·5 crores (exclusive of township and working finance) and to provide employment for about 1,700 persons of all categories inclusive of 1,200 engineers and 250 technicians. The details of items proposed to be manufactured are as under:

Item	Capacity per annum (tons)
Sulphadimidine	280
Sulphaguanidine	130
Sulphaacetamide sodium	50
Sulphanilamide	50
Acotazolamide	25
Hydrazide of Isonicotinic Acid (I.N.H.)	20
Luminal	10
Phenacetin	100
Amidopyrin	40
Metamizol	10
Piperazine adipinate	50
Vitamin B-1	30
Vitamin PP (Amide of Nicotinic Acid)	20
Folic Acid	1
Vitamin B-2	5
Ditrazine	30
TOTAL	851

2. *Antibiotics Project*—It is estimated to involve an outlay of Rs. 10·0 crores and to provide employment for 2,500 personnel. The capacities for different antibiotics envisaged under the project are:

Item	Capacity per annum (tons)
Penicillin	85
Streptomycin	70
Dihydrostreptomycin	15
Chlorototracycline (Biomycin)	70
Oxytetracycline	25
Tetracycline	25
Nystatin	10
TOTAL	300

3. *Phyto-Chemicals Project.*—It is estimated to cost Rs. 6.2 crores and to provide employment for 1,200 persons including 200 engineers and technicians. The capacities for different items envisaged under this project are :

Item	Capacity per annum
Caffein	50 tons.
Ephedrine	15 tons.
Digitalis glycosides	100 Kgs. (50 Kgs. each of purpurea & lanata).
Ergot alakalloids	50 Kgs.
Atropine Sulphate (from hyocymusumticus)	50 Kgs.
Scopaline hydrobromide (from Datura Inoxia)	10 Kgs.
Reserpine	200 Kgs.
Vitamin P (from tea waste)	1 ton.
Papain	10 tons.
TOTAL	76·41 tons.

Production.—The major items of production in the public sector, *e.g.* Pencillin and D.D.T. have recorded rising levels of output as shown below:

	Penicillin million mega units	D.D.T. (tons)
1955	4·00	172
1956	14·09	814 (50%)
1957	17·50	623
1958	26·93	1,755
1959	28·71	2,199
1960	39·70	2,786

With rising levels of production the cost of production as well as the selling prices were brought down as shown below :

	Cost of Production		Selling Price	
	1956-57	1960	1956-57	1960
	(Rs. per mega unit)		(Rs. per mega unit)	
Penicillin	N.A.	N.A.	0·69	0·50
	1955	1960	1955	1960
	(Rs. per Kg.)		(Rs. per Kg.)	
D.D.T.	3·35	2·62	5·88	3·20

Developments in the Private Sector.—During the Second Plan period, the private enterprise increased the facilities for the processing of drugs apart from making a beginning for the manufacture of some of the essential drugs. The bottling facilities for antibiotics *e.g.*, Penicillin and Streptomycin have been expanded.

Major schemes for the manufacture of bulk drugs have also been implemented in the private sector between 1956-61. In some cases such as the manufacture of Vitamin C by M/s. Sarabhai-Merck Ltd., Baroda, the scheme as so far implemented is based on the use of imported sorbitol, but the manufacturing programme approved by Government provides for the production of sorbitol also in the next phase so that in the initial years of the Third Plan, the Vitamin C manufacture in the country would be linked with indigenous glucose via sorbitol.

As regards progress in the manufacture of drugs from the other intermediate raw materials of organic origin instead of penultimates, there has hardly been any significant improvement until the end of the Second Plan. The growth of capacity in the last five years has been by and large on a horizontal basis leading to enlargement of production potential for drugs from penultimate products. Schemes approved in the last one year or so to ensure vertical growth, for example, manufacture of A.S.C., the raw material for sulpha drugs from acetanilide and beta-ionone used in Vitamin A manufacture from lemongrass oil are expected to bring the expansions into conformity with the policy of encouraging the manufacture of drugs as distinct from processing.

Brief particulars relating to major schemes implemented in the Second Plan period are given below :

Firm	Drug	Annual capacity installed
1	2	3
M/s. Alembic Chemicals, Baroda	Penicillin	10 million mega units.
	Calcium lactate	60 tons.
M/s. Mac Laboratories	Chloramphenicol	0·8 tons.
M/s. Parke-Davis	Do.	expansion from 3·6 to 10 tons.
M/s. Dumex	Tetracycline and Oxytetracycline	2 tons and 5 tons.
M/s. Glaxo Laboratories	Vitamin 'A'	10 million mega units.
M/s. Roche Products	Do.	10 "
M/s. Sarabhai-Merck	Vitamin 'C'	60 tons.
M/s. Merck Sharp and Dhome	Vitamin B. 12	25 kilograms.
M/s. Sarabhai Chemicals	Nicotinic acid and amide.	15 tons.
	Calcium lactate	132 tons.

1	2	3
M/s. Ciba Pharma	Reserpine	12 kilograms.
M/s. May & Baker	Ephedrine	1·0 ton.
M/s. British Drug House. M/s. Ciba Pharma M/s Glaxo Laboratories M/s. Merck Sharp & Dhome	Synthetic harmones	398 kilograms.
M/s. Geoffery Manners	Phenacetin	20 tons.
M/s. Alta Laboratories	Aspirin	196 tons.
M/s. Atul Products	Nikethamide	4·8 tons.
M/s. Hoechst Pharmaceuticals	Procaine hydro-chloride.	6·4 tons.

Production.—There has been an all-round increase in the production of drugs in the country during the Second Plan period as shown below:

Item	Unit	1956	1957	1958	1959	1960
Chlorotetracycline	kilograms	710	1,383	1,770	1,780	816
Chloramphenicol	,,	2,156	1,526	2,077	2,924	3,872
Sulpha drugs (All types)	'000 kilograms	98	105	131	134	148
Anti-T.B. drugs						
(a) I.N.H.	,,	4	15	20	30	27
(b) PAS & its salts	,,	9	43	66	100	83
Anti-leprosy drugs (DDS and its derivatives)	kilograms	4,917	2,490	2,450	3,981	7,551
Anti-dysentery drugs (Quinolines)	'000 kilograms	10	20	25	23	25
Vitamin A	million mega units	..	..	N.A.	2	14·4
Vitamin B-12	grams	..	..	N.A.	606	5,100
Galenicals	'000 grams	797	863	815	993	924
Sodium Salicylate	'000 kilograms	51	118	162	179	213
Caffein & its salts	kilograms	4,149	5,278	6,615	6,964	4,574
Opium and its salts	,,	1,325	1,231	1,422	1,537	1,620
Quinine	tons	89·2	58·8	71·3	66·4	99·2
Strychnine & Brucine	kilograms	9,482	4,636	5,743	8,922	14,406
Aspirin	,,	..	..	3,178	26,600	77,546
Phenacetin	,,	N.A.	N.A.	N.A.	15,050	16,668
Reserpine	grams	..	258	3,680	7,930	9,020
Harmones	kilograms	..	3	23	76	40·2
Nikethamide	,,	647	3,240	3,900	4,922	3,346
Liver Extract—						
(i) Oral	'000 kilograms	126	112	138	171	161
(ii) Injections	million cubic centimetres	24·41	28·39	36·04	36·85	40·9
Salicylic Acid	tons	..	65·3	111·3	137·6	119·0
Calcium Lactate	kilograms	46,985	41,181	65,333	77,689	71,488
Calcium Gluconate and other calcium salts	,,	17,527	23,266	30,391	49,888	58,508

Pesticides.—There is no production of D.D.T. in the private sector. The progress in the expension of capacity and production of B.H.C. and Copper Oxychloride is shown below. Capacity has also been developed during this period for other products, for example, ethyl-dibromide, organo-mercurials and zinc phosphide.

(tons)

	Benezene Hexachloride		Copper Oxychloride	
	Capacity	Production	Capacity	Production
1956	2,500	2,022	..	..
1957	2,500	1,857	144	..
1958	3,000	3,080	1,644	600
1959	3,900	3,021	2,124	392
1960	3,900	3,830	2,284	586

Imports & Exports.—The imports of drugs during 1954-55 were valued at Rs. 13·14 crores. They went up to Rs. 16·31 crores in 1957 but later on they showed a downward trend and came down to Rs. 8·83 crores in 1959. In 1960 the imports were valued at Rs. 10·73 crores. The following statement shows the year-wise values of important categories of drugs and pharmaceuticals imported during the last few years:

Item	1957	1958	1959	1960
1. Antibiotics—				
Aeromycin	34·56	33·73	28·63	28·82
Chloromycetin	39·95	40·4	57·89	57·59
Penicillin & its preparation	166·22	96·39	39·95	36·68
Streptomycin & its preparations	163·82	91·45	2·90	73·17
Terramycine	23·21	23·64	23·87	33·83
Other antibiotics	78·70	45·57	33·79	64·11
TOTAL	511·47	331·18	117·03	294·20
Vitamins & Vitamin Preparations	254·79	189·48	188·42	130·96
Antimalarials	2·85	1·33	0·33	0·54
S[illegible]ha Drugs	84·40	91·67	86·72	126·25
Anti-Tuberculosis I.N.H.	3·05	0·46	0·25	0·47
Proprietory & patent medicine	246·13	67·58	79·11	105·90
Other drugs & pharmaceuticals	536·80	339·36	350·92	414·75
GRAND TOTAL	1,639·49	1,021·06	882·78	1,073·07
Pesticides—				
D.D.T.	114·11	296·17	440·35	552·18
B.H.C.	1·36	1·48	13·49	3·14

Exports.—Exports of drugs and pharmaceuticals were valued at Rs. 1·01 crores in 1957, Rs. 0·89 crores in 1958, Rs. 0·83 crores in 1959 and Rs. 0.94 crores in 1960. Exports of D.D.T. and B.H.C. during last few years were as follows:

(Value in Rs.)

Item	1957	1958	1959	1960
1. D.D.T.	27,378	15,581	97,185	8
2. B.H.C.	10,314	34,809	86,190	5,875

Foreign Collaboration.—The indigenous manufacturers have entered into technical collaboration arrangements with producers abroad. The major producers and their collaborators are as shown below :

Indian manufacturers	Foreign firms providing technical collaboration
M/s. Sarabahi Chemical Ltd., Baroda . .	M/s. Squibbs & Son, New York.
M/s. Sarabhai Merk, Baroda . . .	M/s. Merk Darmstadt of W. Germany.
Hindustan Antibiotics Ltd. . . .	M/s. Merk Sharp & Dhome, New York (only for streptomycin).
M/s. Bio-Chemical & Synthetic Products Ltd.	M/s. Cilag of Switzerland.
M/s. May & Baker Ltd.	M/s. May & Baker, England.
M/s. Neo-pharma Ltd., Bombay . .	M/s. Archffor S. V. H. Milan, Italy.
M/s. Mac Lab. Ltd., Bombay . . .	M/s. Carlo Erba S. P. A. Milan, Italy
M/s. Biological Products Ltd., Bombay .	M/s. Evans Group of Companies, U.K. M/s. Medimepex, Hungary.
M/s. Atul Products, Bulsar . . .	M/s. Ciba Ltd., Basle, Switzerland.
M/s. Geoffery Manners Ltd., Bombay .	M/s. American Herne Products, U.S.A.

Investment.—The investment in the drugs and pharmaceutical industry during the Second Five Year Plan has been provisionally estimated at Rs. 10·4 crores inclusive of Rs. 1·73 crores invested in the public sector. It does not include investment on insecticides which may be estimated at Rs. 1·06 crores in the public sector.

II. Programme of Development in the Third Five Year Plan :

Estimated Requirements.—The demand for drugs and pharmaceuticals falls under the category of an essential requirement which will impose a heavy strain on foreign exchange resources if it has to be met from imports. The rate of expansion of demand for drugs is considerably influenced by the price level as well as the programmes for extension of medical

facilities envisaged by the public authorities. Growth of population is also a relevant factor entering into the assessment of demand. Against the background of all these considerations, the Development Council for Drugs and Pharmaceuticals has made the forecast of requirements of drugs in 1965-66 as follows :

Item	Unit	Estimated Requirement by 1965-66
Antibiotics—		
Penicillin	million mega units	120
Streptomycin	tons	150
Tetracycline	"	50
Chloramphenicol	"	50
Sulpha Drugs	"	1,000
Anti-T.B. Drugs—		
P.A.S. & Salts	"	400
I.N.H.	"	100
Anti dysentery Drugs (Quinolines)	"	75
Anti-leprosy drugs D.D.S.	"	40
Anti-diabetic (oral)	"	10
Anaesthetics—		
(i) Procain H.C.L.	"	75
(ii) Barbiturates	"	10
Antifilarial drugs	"	75
Vitamins—		
A	million mega units	20
B1	tons	75
B2	"	10
B6	"	2·5
B12	kilograms	25
C	tons	125
D	"	1
K	kilograms	75
Nicotinic acid & Amide	tons	75
Vitamin P	"	1
Vitamin E	kilograms	600
Other Important Drugs—		
Aspirin	tons	800
Sodium salicylate	"	300
Phenacetin	"	200
Salicylic acid	"	1,500
Niketharnide	"	15
Reserpine	kilograms	200
Caffein	tons	100
Ephedrine	"	15
Insulin	mega units	1,000
Adrenaline	kilograms	50
Cortisone Derivatives	"	500

The Development Council for Organic Chemicals in collaboration with the Directorate of Plant Protection, Quarantine and Storage has assessed the demand for pesticidal chemicals etc., as under :—

Item	Requirement by 1965-66 (tons)
B.H.C.	15,000
D.D.T.	6,000 (3,000 tons for plant protection and 3,000 tons for public health).
Other Chlorinated insecticides like Endrin, Aldrin, Chlordane etc.	875
Organic Phosphatics like Parathion, & Malathion	1,000
E.D.C.T.	10,000 (3 : 1 mixture)
Copper Oxychloride	2,000
Organic Mercurials	100
2-4-D & related Weedicides	1,500
Other Pesticidal materials	2,000

The demand estimates have been broadly accepted as the basis for planning under pharmaceuticals and drugs.

Schemes under Implementation.—A major break-through in the field of pharmaceuticals and drugs is expected to be achieved by the execution of the Russian aided drug projects in the public sector. The Organic Intermediates (B.C.I.) project in the public sector described in detail under the Dyestuff Industry is expected to play a vital part in ensuring vertical growth by providing some of the starting organic raw materials for synthetic drug manufacture apart from making available bulk supplies of 200 tons of P.A.S. and 200 tons of Aspirin produced under it. In addition to these developments which are expected to materialise in the last two years of the Third Plan, the developments in the public sector cover :

(a) the project for the manufacture of 40,000 to 45,000 Kilos of streptomycin and dihydro-streptomycin expected to be in operation at Pimpri in 1962-63 ;

(b) the project for the manufacture of Tetracyclines at Pimpri ;

(c) the scheme for the modernization of the Opium Alkaloids factory of the Central Government at Cossipore.

In the private sector, the following schemes which are under implementation are expected to supplement the programmes of the Government in the drugs field :

Name of the Firm	Capacity
Antibiotics—	
M/s. Standard Pharma Ltd., Calcutta	10 million mega units of Penicillin & 180 kilograms of Streptomycin.
M/s. Sarabhai Chemicals, Baroda	15,000 Kgs. of streptomycin and 3 tons of Tetracyclin.
M/s. Boehringer Knoll (I) Ltd.	4·2 tons of Chloramphenicol.
M/s. Neo-Pharma	3·6 tons of Chloramphenicol.
M/s. Lepetit Ranbaxy	5·0 tons of Chloramphenicol.
M/s. Dumex Ltd., Chandigarh	2 tons of Tetracyclines & 3 tons of Oxy-tetracycline.
Sulpha Drugs—	
M/s. May & Baker, Bombay.	Expansion from 65 tons to 150 tons.
M/s. Merck, Sharp & Dhome, Bombay	7 tons
M/s. Ciba-Atul M/s. May and Baker	Manufacture of ASC.
Vitamins—	
M/s. Sarabhai-Merck, Baroda	1000 kilograms of Vitamin B-6
M/s. Atul Products, Bulsar	15 kilograms of folic acid.
M/s. Sarabhai Chemicals	13 tons of Vitamin B-12.
Drugs of Vegetable Origin—	
M/s. Burroughs Wellcome, Bombay	150 kilograms of Emetine.
Benzene Hexachloride—	
M/s. Tata Chemicals, Mithapore	1,200 tons of B.H.C.
M/s. Pesticidies Ltd., Bombay	1,500 tons of B.H.C.

Targets for Achievements.—The creation of further capacity in the field of pharmaceuticals must be related to the gaps required to be filled *vis-a-vis* the demand estimates forecast for the end of the Third Plan. The production of complex intermediates in the private sector has to be closely dovetailed with the manufacture of such items as have already been planned in the plants under construction in the public sector. In planning new facilities for the processing of drugs such as vialling of antibiotics, the possibilities for dispersal and decentralisation should be more fully exploited under the Third Plan in accordance with the recommendation made by the Drug Project Location Committee (D.P.L.C.) in 1959 that "the plan should be formulated for the establishment of regional processing plants of a given minimum economic size to produce the finished drugs based on the drugs manufactured in bulk by the Synthetic Drugs plant and the Antibiotics plant".

Raw Materials.—For the realisation of production in balance with the targets fixed for the Third Plan, the Development Council for Drugs estimated the requirements of chemical raw mateials as follows:

Name of the Material	Annual requirement (tons)	Project	Production planned or licensed (tons)
1	2	3	4
Acetanilide	1,800	Basic Chemicals and Intermediates Project, Maharashtra (B.C.I.)	2,000
Acetic-anhydride	1,000	Private Sector ..	800-900
Acetyl-acetone	180	Synthetic Drug Project, Andhra (S.D.P.)	170
Acetyle Chloride	7	Private sector	50
Acetoacetic-ester	100	S.D.P.	100
4:7 dichloroquinoline	20	..	
Acetyle aminophenol	20	..	
O-Aminophenol	11	..	
M-Aminophenol	380	B.C.I.	250
Aluminium isopropoxide	200	..	
N-butylamine	20	..	
M-chloroaniline	45	B.C.I.	70
M-chlorobenzene	18·8	B.C.I.	100
P-chloronitrobenzene	275	B.C.I.	500
Chlorosulphonic acid	7,320	Private Sector	
Cyanmethin	56	..	
Di-chloracetic acid ester	32·5	..	
2-Diethylamine ethanol	54	..	
Diethylamino-1-methylbutylamine	14	..	
Diethylamine	25	S.D.P.	50
Diethyl ethoxymethylene meleate	27·5	..	
Oxalic Acid	23	..	
Dimethyl Sulphate Methyl Sulphate	70	..	
Ethyl Bromide	31	..	
Guanidine Salts	1,260	..	
Hexamine	150	S.D.P.	10

1	2	3	4
Hydrazine hydrate	50	(S.D.P.)	1
Hydrobromic Acid	9·5	..	
Iodine	68	..	
Keto Acetol	165	..	
Malic Acid	1,156	..	
Metal Lithium	5	..	
Metal Magnesium	2·7	..	
Metal Sodium	170	..	
Nitroacetophenone	150	..	
O-Nitrophenol	7	..	
P-Nitrotoluene	76	(B.C.I.)	1,000
Palmitoyl Chloride	25	..	
Phenol	1,000	(B.C.I.)	1,500
Phenylacetamide	350	(B.C.I.)	60
Hydrazine sulfate	170	..	
Phosgene	160	..	
Phosphorous Oxychloride	165	..	
Phosphorous Pentoxide	15	..	
Phthalic Anhydride	6	(B.C.I.)	3,000
B-picoline or Ethylmethyl-pyridine, Methylethylpyridine	137	..	
Gamma Picoline	110	..	
Piperzine Hydrate	40	(S.D.P.)	40
Sodium Cyanamide	21	..	
Propargyl Bromide	108	..	
Sodamide	10	..	
Tartaric Acid	100	..	
Thienyl Chloride	100	..	
Thioures	140	..	
Trimethylamine Hcl	9	..	
Vinyl Acetate	151	..	

Investment.—Within the overall investment of Rs. 39·3 crores envisaged for the Third Plan in this field, the share of the private sector is placed at about Rs. 10 crores.

Drug Farms.—An important development connected with the production of phyto-chemicals is the cultivation of medicinal plants and the setting up of drug farms therefor. Proposals for drug farms are under formulation by the Council of Scientific and Industrial Research in consultation with

the State Governments. Systematic cultivation of medicinal plants has assumed urgency in view of the decision taken to establish a phyto-chemical plant in the public sector in the Third Plan.

Research.—The suggestions made under the Secound Plan are reiterated by reproducing the relevant extract from the volume on the Programmes of Industrial Development 1956-61 :

> Research plays a considerable part in the development of pharmaceutical industry. Most of the leading manufacturers abroad have their own laboratories where research is conducted with a view to improving their products and discovering better and more efficacious drugs. The drug industry is one where high standards have to be maintained by constant research and experiments, but the research facilities available in this country are meagre. Barring a few institutions like the Haffkine Institute and the Central Drug Research Institute set up by the Government, there are hardly any laboratories where research work on new drugs is conducted. Research facilities are essential not only for the maintenance of quality and improvement of products but also for keeping abreast of the developments in other parts of the world and their provision should receive special attention in the planning of establishments for drug manufacture. Such research laboratories will also be helpful in conducting investigations on the production of cheaper substitute medicines from indigenous raw materials.

The following production targets by 1965-66 are envisaged for some of the important drugs :

Item	Unit	Production
Sulpha drugs	tons	1,000
Penicillin	million mega units	120
Streptomycin	tons	150
P.A.S.	tons	400
Anti-dysentery drugs	tons	75
I.N.H.	tons	100
Phyto-chemicals	tons	76·4
D.D.T.	tons	2,800
B.H.C.	tons	15,000

48. PLASTICS

The Plastics industry falls into two distinct sections *viz.*, the processing sector and the manufacture of the moulding powders. The programme for development for this industry formulated under the Second Plan covered both the sectors.

1. Review of Progress in the Second Plan:

Processing Industry:

Targets.—In view of the difficulty in assessing the demand for some of the finished plastics goods consumed for non-industrial purposes, which is susceptible to price changes and competition from goods based on traditional use, the total requirements of these products were estimated in terms of the demand for moulding powders. This demand was estimated at 11,600 tons by 1960-61 as gainst 6,050 tons in 1955-56. As regards the plants for the manufacture of plastics goods, no specific targets of capacity were proposed. The general recommendations made in regard to them were:

(a) Manufacture of plastics goods lends itself well to development in small-scale units in proximity to the centres of consumption.

(b) For leather cloth no further addition to capacity seems necessary even if the demand was to rise to nearly twice the level of production of about 2·65 million yards in 1955.

(c) Expansion of capacity for polyethylene films, resin laminates and unsupported sheets of PVC may be necessary. The exact quantum of development necessary in the Second Plan in these sectors will depend on trends in consumer industries which are difficult to forecast and have necessarily to be kept under periodical review.

Capacity and Production.—Considerable progress has been made during the Second Plan in the manufacture of processed goods. For PVC unsupported film, two new calendering plants have been brought into operation. A beginning has been made in the extrusion of polyethylene piping and large-sized objects from polyethylene such as buckets, baskets and basins have begun to be moulded. Manufacture of industrial items such as steering wheels and refrigerator parts has also attracted attention. Between 1955 and 1960 the machine capacity of the processing industry has increased from 11,200 tons to 17,445 tons for compression moulding, 550 to 748 oz., for injection moulding and the number of extruders went up from 55 to 95.

The production of processed plastics goods showed all round expansion in the Second Plan period as indicated below:

Product	Unit	Installed capacity		Production					
		1955	1960	1955	1956	1957	1958	1959	1960
Phenolic laminates	tons	450	450	140	232	335	370	486	614

Product	Unit	Installed capacity		Production					
		1955	1960	1955	1956	1957	1958	1959	1960
PVC unsupported sheets	tons	210	1,250	155	101	175	584	802	1088
Polyethylene film and tubing	tons	263	1,090	382	517	700	827	1055	1416
Leather cloth	'000 yds.	6,879	9,052	2,624	2,640	3,657	4,243	5,420	6,392
Moulded goods	million gross			2·5	3·6	3·8	4·5	5·45	7·11
Consumer goods—									
(a) Tooth Brush	million nos.	24	27	5·2	9·6	13·5	10·3	11·83	11·56
(b) Spectacle frames	million nos.	1·8	3·0	0·8	1·3	1·64	2·02	1·9	2·08
(c) Fountain pens	million nos.	variable		6·0	9·0	7·6	10·3	10·0	10·0
(d) Plastic buttons	thousand gross	2,487	3062 (one shift)	1,322	1,116	1,167	2,651	3,611	5,737

Indigenous production of moulding powders which has been estimated at about 9,460 tons had been supplemented by 3,018 tons of imports in 1960 to cope with the operational demands of the processors. The off-take of plastic goods exceeded the plan expectations by a small margin and this entailed an expenditure of Rs. 120 lakhs in 1960 for feeding the industry with supplementary imports of raw materials.

Exports and Imports.—The Indian plastics industry entered the field of exports only during the last decade. The exports consist mainly of manufactured plastics materials. In 1955, the Plastics Export Promotion Council was set up and export incentive schemes were introduced. As a result, the export of plastics products has registered substantial increase in the last few years as may be seen in the table below. There have been some imports of manufactured plastics articles *e.g.*, plastic buttons, tableware and toys. In addition there have been considerable imports of semi-fabricated products *e.g.*, films, sheets, rods etc. The value of these imports are as follows :

(Value in Rs. lakhs.)

	Exports	Imports
1957	14·47	102·36
1958	22·10	68·21
1959	51·48	93·53
1960	42·85	143·58

Plastic Moulding Powder :

Targets and Achievements.—The Second Plan underlined the desirability and urgency of meeting fully from domestic production the rising demand for moulding powders envisaged in this period. In addition to the capacity of 12,810 tons set for the private sector, it was expected that industrial nitrocellulose (of 8-10 per cent nitrogen) would be available upto 600 tons in

1960-61 from the ordnance establishments for meeting the consumption requirements of celluloid, leather cloth and lacquer industries. For actual production, the 1960-61 target was visualised at 10,600 tons. The break-up of these targets and the actual achievements are indicated below:

(Figures in tons)

Moulding Powder	Second Plan Target		Achievements	
	Capacity	Production	Capacity	Production
Phenol Formaldehyde (P.F.)	1,310		3,000 (2 shifts)	2,041
Urea Formaldehyde (U.F.)	500		940 (Continuous operation)	353
Cellulose Acetate (C.A.)	900	1,0600	Nil	Nil
Polystyrene	3,500		5,400 (Continuous operation)	3,708
Polyvinyl Chloride (PVC)	1,500		Nil	Nil
Polyethylene	5,100		6,200 (Continuous operation)	3,361
TOTAL	12,810	10,600	15,540	9,463

The plant for the manufacture of 3,600 tons of polyvinyl chloride of M/s. Calico Mills located at Trombay has almost been completed by the end of the Second Plan. Whereas the polythylene plant of M/s. Alkali & Chemical Corporation and the polystyrene plant of M/s. Kilchand Devchand & Co., (M/s. Polychem Ltd.) have gone on stream according to schedule. There has been a delay of about one year in the installation of the polyethylene plant of M/s. National Carbon Company (now M/s. Union Carbide India Ltd.) which were reckoned to start operations by the end of 1958. Part of the delay is on account of the long time taken about arrangements for alcohol supplies and co-ordinating the production schedules of this project with those of the alcohol suppliers.

The actual production of different moulding powders recorded expansion as per the following data:

(tons)

	P.F.	U.F.	Polystyrene	Polyethylene
1956	984	5	Nil	Nil
1957	1,175	4	1,077	Nil
1958	1,326	162	1,906	Nil
1959	1,811	321	3,314	2084
1960	2,100	360	3,618	4,147

With the exception of polyethylene which was based on ethylene from alcohol, the other moulding powders were based on imported intermediates. With rising levels of production of these products, the demand for imports of the raw materials *viz.*, pheno', urea, formaldehyde and styrene monomer added to the maintenance bill.

Imports of moulding powders went down substantially after the commissioning of regular production of polystyrene and polyethylene as shown below :

Imports of Moulding Powder

Q=Quantity in million lbs.
V=Value in Rs. lakhs.

	PF		UF		Polystyrene		Polyethylene	
	Q	V	Q	V	Q	V	Q	V
1956	0·49	4·36	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1957	0·67	7·77	0·34	4·42	3·64	52·29	4·02	76·85
1958	0·53	6·03	0·83	10·86	0·26	4·67	3·37	61·30
1959	0·73	7·96	0·71	9·25	0·02	0·56	2·58	46·86
1960	0·94	10·01	0·89	11·02	0·03	0·42	0·58	10·36

Problems of the Industry.—The main problem of the industry related to shortage of raw materials—imported styrene in the case of M/s. Polychem Ltd.—on account of foreign exchange required for such imports.

Investment and Employment.—It is estimated that the total investment in the plastics industry during the Second Plan has been about Rs. 10 crores of which Rs. 4 crores would have been the foreign exchange component. The total labour employed in this industry in the large-scale sector has been about 8,000 persons. This does not include employment in plastics fabricating units in the small scale sector.

II. Programme of Development in the Third Plan :

The record of the plastics industry in other countries testifies to its vigorous growth in the last decade. The availability of plastics materials has opened up new markets and applications and stimulated consumption in traditional as well as new outlets. By and large, the growth of this industry has not been decided on the conventional basis of filling gaps in known demands. Large-scale production has a salutary effect on prices and facilitates access to new customers, internal as well as external, on the basis of price advantage.

A rapid growth of the plastics industry in India has been envisaged for the Third Plan because the factor which inhibited its vigorous expansion *viz.*, absence of domestic primary materials would be simultaneously overcome. Further, the plastics industry is being reckoned as a new major

foreign exchange earner in the coming years. To fulfil this responsibility, the plastics materials will have to be produced at an economic price so that they could be competitive in the international market. The organisation of production of plastics on an optimum scale is a logical corollary to the approach and objectives of developments in this field.

Processing of Plastic Goods.—As regards the processed plastic goods, the basic approach underlining decentralisation and disposal of processing activities which was recommended under the Second Plan should hold good in the following quinquennium also. The potential of the small scale sector should also be exploited fully in this field. To implement the policy of decentralisation successfully, it has been recommended that the processing activities of the primary producers should be limited to 25 per cent of the output of the moulding powders.

The creation of additional capacity in the processing sector to match the availability of moulding powders would involve substantial investment in overall terms as well as foreign exchange. In this context attention has to be given to the indigenous manufacture of dies, moulds and other equipment as well as to the planning of capacity in relation to its use on double shift basis.

Targets for Moulding Powders.—For meeting the domestic demand and export targets, it is envisaged that the indigenous production will have to be 74,000 tons (165·0 million lbs.) in 1965-66. To achieve this level or production, the capacity target is visualised at 85,000 tons (190 million lbs.) which is distributed between the different plastics materials as shown below :

(tons)

Material	Capacity	Indigenous Requirements	Exports
P. F. moulding powder	6,700 (15)	8,900 (20)	1,340 (3)
U. F. Moulding powder	4,450 (10)		
Cellulose acetate moulding powder (including butyrate, propronate & ethyl cellulose).	6,700 (15)	4,450 (10)	890 (2)
Polystyrene (including styrene alloys)	13,400 (30)	40,000 (90)	8,000 (18)
Poloylefines	26,800 (60)		
P. V. C.	13,400 (30)	8,900 (20)	890 (2)
Polyvinyl acetate	4,450 (10)		
Cellulose nitrate	890 (2)		
Laminates	1,780 (4)		
Nylon	890 (2)		
Acrylics	1,780 (4)		
Polyesters	1,340 (3)		
Polyurethanes	890 (2)		
Others	1,340 (3)		
TOTAL	84,810 (190)	62,250 (140)	11,120 (25)

(Total of indigenous requirements and exports—73,370 tons)
Figures in bracket indicate equivalent in million lbs.

Plastics is a field in which the targets are not immunable ceilings. Revision of the overall target as well the target *inter se* might merit favourable consideration from the export angle as well as the potential of some of the plastics to provide substitutes for scarce materials like rubber and leather.

The rationale behind the levels of development specified for the different groups of moulding powders and other relevant details are outlined in the following paragraphs.

Thermo-setting moulding powders.—In regard to thermo-setting moulding powders definite programme for the manufacture of phenol formaldehyde and urea formaldehyde only have been put down as it is not possible to envisage a definite programme for others such as melamine, epoxy, alkyds etc. Though in application phenolics are giving place to thermo plastics, with large growth of electricity generation envisaged during the Third Plan, the demand for phenol formaldehyde moulding powders for the manufacture of electrical accessories is expected to grow and sustain the expansion proposed. While no separate estimate can be given for the G. X. and G. P. grades, it is expected that the electrical grade would form the bulk of production.

Normally urea formaldehyde is used for moulding articles requiring a large variety of colour where it cannot be done with phenol formaldehyde moulding powders. The growth of demand of both may, therefore, be assumed of the same order although in the plastics buttons industry, urea formaldehyde is meeting with some competition from polysyrene because of the relative cheapness of the latter. On the other hand, with cheap availability of urea from fertilizer factories, urea fomaldehyde moulding powders may even take the place of phenolics in many applications.

Thermo Plastic Moulding Powders:

Polystyrene.—Although the application of strainght polystyrene has its drawbacks, the co-polymers and styrene alloys have found extensive applications in many different fields. In view of the relative cheapness of this material, it is likely to be popular in many applications where other plastics were used previously.

Poly-Olefines.—The target capacity under this head includes both high pressure and low pressure polyethylene as well as polypropylene. A large increase in the consumption of polyethylene may be foreseen because of its likely extensive application as a lining material in packing fertilizers. It has been roughly estimated that in this field alone, the requirements may reach the level of 10 million lbs. annually when all the fertilizer projects proposed under the Third Plan go into production. Another likely field of application of polyethylene is its use as liner for canals to prevent seepage. Furthermore, with larger availability of polyethylene and the lower price as a consequence of the expansion of the industry much greater use of polyethylene may be envisaged, as materials for packaging as well as for finished goods for exports. With the sugar target at 3·5 million tons the supply position of alcohol for production of polyethylene may be somewhat easier than what was anticipated earlier, but by and large, future production of polyethylene will have to be based on alternative raw materials like natural gas, coke oven gas petroleum naphth and refinery gases.

Poly-Vinyl Chloride.—A large increase in the production of this powder has been envisaged because it will consume some quantity of unutilized chlorine produced by the electrolytic caustic soda plants. However, the production of the other major raw material *i.e.*, calcium carbide in India has not yet been stabilised both in regard to its quality and price. Unless good quality carbide is produced economically, the target envisaged here may not be achieved. Opinions have been expressed that production of poly-vinyl chloride via ethylene-di-chloride may be somewhat cheaper. If calcium carbide is not found economic as raw material, other starting materials such as natural gas, refinery gas or naphtha would have to be considered. Export of P.V.C. is also dependent on the cost of production and therefore, the establishment of units of optimum economic capacity would be essential.

Others.—Among the important plastics under this head is cellulose acetate which is popular with the Indian moulder. This is based on indigenous cotton linters.

Schemes licensed for implementation.—The following schemes have been licensed for implementation :

Name of the firm	type of scheme	Capacity (tons)
P. F. Moulding Powder		
M/s Saurashtra Electrical and Metal Industries Ltd., Bombay	(New)	900
M/s Hyderabad Laminated Products Ltd., Secunderabad	(New)	600
U. F. Moulding Powder		
M/s Saurashtra Electrical and Metal Industries Ltd., Bombay	(New)	300
Polystyrene		
M/s Polychem Ltd.	(Exp)	1,500
M/s Hindusthan Polymen Ltd., Andhra Pradesh	(New)	7,500
Polyethylene		
M/s Alkali and Chemical Corporation of India Ltd., West Bengal	(Exp)	5,000
M/s Union Carbide India Ltd., Bombay	(Exp)	9,000
M/s Duncan Bros., Gauhati Assam	(New)	4,000
P.V.C.		
M/s Ahmedabad Manufacturing and Calico Prjnting Co. Ltd., Bombay	(Exp)	3,600
M/s D. C. M. Chemical Works, Kotah, Rajasthan	(New)	6,000
M/s India Cements Ltd., Madras	(New)	6,000
M/s Standard Mills Ltd., Bombay	(New)	5,000
M/s Dhrangadhra Chemicals, Madras	(New)	12,000

Raw Materials.—So far only polyethelene has been based wholly on indigenous raw material. It is expected that styrene monomer would also be produced before the middle of the Third Plan. Phenol would be available from the Durgapur Coke Ovens of West Bengal as well as from the Basic Chemicals and Intermediates plant of the Central Government and certain other units in the private sector. Urea and formaldehyde would also be available indigenously during the Third Plan. Thus except some of the monomers required for items under 'others', most the raw materials would be available indigenously.

Investment and Employment.—It has been estimated that for the programme envisaged here, fixed capital investment necessary would be Rs. 25 crores of which Rs. 10 crores would be in foreign exchange. It is estimated that the total employment in this industry in the large scale sector would be about 40,000 persons.

The following table summaries the Programme of Development of the Plastics Moulding Powder Industry during the Third Plan :

	1960-61 (tons)	1965-66 (tons)
Annual Capacity	15,540	85,000
Production	9,463	74,000

49. PHOTOGRAPHIC FILMS AND PAPER

I. Review of Progress in the Second Plan:

India's film industry is one of the largest in the World and is developing at a fast pace. This can be seen from the fact that the total number of cinema houses in the country increased from about 1,300 in 1939 to 3,250 in 1950. In 1960 their number stood at 4,500. The industry caters for an estimated 80 crores of viewers and employs about 200,000 persons at present. It is thus important not only for its entertainment value and as major medium of mass communication but also because of the large employment which it provides. It is also an important source of revenue to the Government in the form of entertainment tax and excise duty.

It is inevitable from all these considerations that this growing industry would have to be maintained in operation and allowed to grow. To do so, the supply of its requirements of raw film becomes important. The difficult position of the country in regard to the balance of payments on external account led to some amount of restriction on the import of films since 1957. The need for fostering the indigenous manufacture of sensitised photographic materials became more telling as a consequence of these import restrictions. Efforts were made by the Government to encourage developments in this field in both the private and the public sectors. Difficulties were encountered in procuring the very specialised technical know-how in the field till quite recently, apart from doubts expressed about the viability of units established *vis-a-vis* the demand levels obtaining.

The proposal under the Second Plan was that the establishment of a raw film factory should be taken up by the National Industrial Development Corporation in the public sector. After years of negotiation by the N.I.D.C. with several specialist firms, an agreement was concluded with M/s. Bauchet et Cie of France for technical collaboration and a firm decision was taken in 1960 to establish a plant for cine raw films and other products at a site just outside Ootacamund in the Nilgiri Hills, South India. In regard to the locational decision for this project, the factors which played a vital part are the purity and low temperature of water and atmospheric conditions ensuring freedom from dust, smoke and noxious fumes. A private limited company called the Hindustan Photo Films Manufacturing Company was formed by the Government and entrusted with the task of executing this project. According to present schedules the plant is expected to go into production at the end of 1962 and achieve full production about 18 months thereafter.

II. Programme of Development in the Third Plan:

The programmes for the different photographic films and paper are given below :—

(a) *Raw Cine films.*—The demand for raw cine films has been rising steadily. From about 75 million ft. in 1938-1939 valued at Rs. 24 lakhs, the imports increased to 170 million ft. in 1949-50 and were valued at Rs. 95

lakhs. The imports of raw films during the last few years are indicated below:

	Quantity (million ft.)	Value (Rs. lakhs)
1957	271	205
1958	214	164
1959	213	135
1960	273	194

The demand for cinema film is also related to the number of cinema houses, both permanent and temporary. The increase in the number of cinema houses during the last three years has been as follows:

	No. of cinema houses		
	Permanent	Temporary	Total
1957	2,918	1,088	4,006
1958	2,999	1,219	4,218
1959	3,109	1,193	4,302
1960	3,174	1,325	4,499

The increase in the number of cinema houses has been about 500 in the last three years. Assuming a somewhat larger growth in the next six years, it is expected that the total number of cinema houses in India would be about 6,000 by 1966. On the basis that the supply of 270 million ft. of film in 1960 was adequate for 4,500 cinema houses, the estimated requirement of cinema films for 6,000 cinema houses by 1966 would proportionately be about 360 million running feet. Assuming that 100 linear feet of standard 35 mm. film is equivalent to 1·067 sq. metres, the requirement works out to 3·8 million sq. metres approximately. The capacity of the public sector raw film plant has, however, been kept at a level which can take care of the higher demands a few years later.

The three principal stages in the manufacture of cine films are given below:

(1) Conversion of cellulose acetate flakes into plastic and casting it in the form of tough transparent continuous sheets.

(2) The coating of the film with a photosensitive emulsion *i.e.* a suspension of silver halide in gelatine to be coated as a thin uniform layer on the film base.

(3) The finishing of the film *i.e.* the continuous web of coated film to be slit into reels of the required width, perforated along the sides, marked and numbered for identification, made into rolls and packed into cans.

It is proposed to obtain the cellulose acetate flakes from units that have been licensed in the private sector.

(b) *X-ray films.*—With increasing provisions for medical facilities, the requirement of X-ray films for diagnosis of tuberculosis, fractures, ulcers, cancers, kidney stones and similar complaints is continually increasing. The quantity and value of imports of X-ray films during the last four years are given below:

	Quantity (million sq. ft.)	Value (Rs. lakhs)
1957	3·34	49
1958	2·33	37
1959	3·12	51
1960	4·78	57

Compared to the earlier years the import in 1960 was rather large and probably does not represent the true current demand. The import in 1960 was about 0.44 million square metres (1 sq. ft.=0.0929 sq. metres). It is considered that the real demand in 1960 could be taken as about 0.4 manufacture of cameras and easier availability of films and paper, the demand sq. metres by 1965-66. The public sector raw film factory has been licensed to cover the demand thus projected.

(c) *Roll film and photographic paper.*—The current consumption of roll film is about 0·2 million square metres and of photographic printing paper, about 1·5 million square metres. With the beginning of indigenous manufacture of cameras and easier availability of films and paper, the demand for these items is reckoned to be trebled by 1966. Thus, 0·6 million sq. metres of film and 4·5 million sq. metres of photographic paper is estimated to be needed annually by the end of the Third Plan.

The Hindustan Photo Films Manufacturing Co. has been licensed for the manufacture of 0·6 million sq. metres of photo film and 1·8 million sq. metres of photographic paper. It will be able to turn out 2·5 million sq. metres of photographic paper at full capacity.

Licences for the manufacture of photographic printing paper have also been given to the private sector as indicated below:

Name	Capacity (million sq. metres)
M/s. Adross Private Ltd., Calcutta	0·5
M/s. New India Industries, Baroda	1·2

At least two other parties are also manufacturing photographic paper in the small scale sector and the total capacity for photographic paper in the private sector that could be reckoned upon is about 2 million square metres.

Overall position.—The overall position may be summarised as follows:

(Figures in million sq. metres)

Item	Capacity in the private sector	Capacity in the public sector
Cine film	Nil	5·4
X-ray film	Nil	0·6
Roll film	Nil	0·6
Photographic paper	2·0	2·5

The Hindustan Photo Film Manufacturing Company, the only public sector factory would have installed coating capacity to the extent of 12·0 million sq. metres annually. A production of 10·0 million sq. metres of the different photographic items could be achieved with the facilities planned for installation and their full utilisation.

Investment.—The capital investment in the public sector project is expected to be about Rs. 7 crores of which Rs. 4 crores would be foreign exchange. The investment in the private sector is estimated at about Rs. 50 lakhs.

Raw Materials.—Apart from cellulose triacetate, triphenyl phosphate and dibutyl phthalate for making the film base, the following chemicals required for the manufacture of sensitised photographic material would be available indigenously ammonia, ammonium nitrate, potassium bromide, silver nitrate, acetone, butanol and methanol.

Methylene chloride, base paper, potassium iodide, gelatine, wetting agents, sensitising dye-stuffs and stabilisers may have to be imported for the present. On the basis of the production targets set for these items for 1965-66, the value of imported raw materials would be about Rs. 0·6 crore. This can be brought down substantially to below Rs. 10 lakhs per year by developing the production of gelatine and base paper to which attention is already being given.

50. PAINTS AND VARNISHES

I. Review of Progress in the Second Plan:

Targets.—It was estimated that the consumption of paints, varnishes and enamels would rise to 60,000 tons in the last year of the Second Five Year Plan. The production target was, therefore, envisaged at 60,000 tons to be achieved by 1960-61. The then existing capacity of 65,000 tons in 1955-56 was fixed as the capacity target. The capacity and production targets for nitrocellulose lacquers were envisaged at 800,000 gallons and 500,000 gallons respectively.

Capacity and production.—In April 1956 there were 50 major units engaged in the manufacture of paints, varnishes and enamels with an annual capacity of about 65,000 tons. Paint industry was brought within the purview of the Industries (Development & Regulation) Act in 1957. 25 factories with a capacity of about 58,150 tons per annum were registered under the Act. During the period of the Plan one registered unit in Bombay effected expansion of capacity to the extent of 3,150 tons.

The capacity of the paints, varnishes and enamels industry has recently been reassessed by the Development Wing of the Ministry of Commerce & Industry at about 85,000 tons. The reassessed capacity is based on the best performance of each unit in the organised sector in the past years. The State-wise distribution of the reassessed capacity is given below :

	Number of factories	Annual capacity (tons)
Maharashtra	23	34,000
West Bengal	19	39,500
Uttar Pradesh	5	8,100
Madras	3	2,000
Delhi	2	1,000
Andhra Pradesh	1	300
TOTAL	53	84,900

There was no change in the capacity for nitrocellulose lacquers and ancillaries during the Second Plan period.

Pigment/raw materials manufactured.—There was an increase in the capacity for the production of zinc oxide from 12,360 tons in 1956 to 18,000 tons in April, 1961. The capacity for red lead went up from 5,100 tons to 9,780 tons during the Second Plan period. The capacity for titanium dioxide

was doubled during the same period. The position in regard to capacity of major pigments in 1956 and April, 1961 is tabulated below :

	1956 (tons)	1961 (tons)
Zinc oxide	12,360	18,000
White lead	37,20	3,720
Red lead	5,100	9,780
Titanium dioxide	1,800	3,600
Aluminium paste and powder	500	500

The production of paints, varnishes and enamels and nitrocellulose lacquers including ancillaries from 1955 onwards has been as follows :

	Paints, varnishes and enamels ('000 tons)	Nitrocellulose lacquers (lakh gallons)
1955	39	3·0
1956	42	2·4
1957	42	2·7
1958	48	2·7
1959	54	3·0
1960	51	3·5

The production of paints, varnishes and enamles increased by about 30% during the Second Plan period; even so, the target of 60,000 tons has not been achieved mainly due to lack of sufficient demand. It would appear that there has been some decrease in production in 1960. This is so on weight basis. The production of quality surface coating materials like aluminium paint, natural and synthetic enamels, stoving varnishes, heald varnishes and insulating varnishes has, however, registered an increase during 1960 as compared to 1959. Significant advance was made during the Second Plan period in the production of quality paint materials, protective coatings for structurals; finishes for transport (road, rail, sea and air); and synthetics and nitrocellulose for general industrial applications. The progress made in the Second Plan period in the production of different types of coatings is as follows :

Item	Production (organised sector) 1955	1960
Distemper (dry & oil bound)	1,481 tons	3,565 tons.
Plastic emulsion paints.	192 tons	363 tons.
General purpose paints, enamels and varnishes for buildings.	22,612 tons	28,463 tons.
Structural paints	864,750 gallons	1,032,735 gallons.
Finishes for industry, transport and electricals.	1·35 million gallons.	2·26 million gallons.

The system of sale of liquid paints by volume measure was introduced in 1960. Previously, the bulk of liquid paints used to be sold by weight. The measurement of paint by weight leads to price cutting between manufacturers which is rendered possible by loading the paint with heavy extenders and lowering the quality of the product. The sale of liquid paints by volume will lead to improvement in quality of the paints marketted in the country.

The production of nitrocellulose lacquers suffered a setback during the earlier years of the Second Plan but there was an improvement in the later years. However, the production in 1960 has fallen considerably short of the target of 500,000 gallons laid down in the Plan.

The production of various paint pigments from 1955 onwards has been as follows :

	Zinc oxide	White lead	Red lead	Titanium dioxide	Aluminium paste and powder
1955	6,370	730	3,950	1,810	260
1956	5,110	637	3,620	1,700	328
1957	5,450	1,020	4,120	1,670	452
1958	8,825	1,100	4,940	1,715	333
1959	7,045	1,010	4,200	1,840	421
1960	8,550	866	3,420	2,680	425

Manufacture of new products.—The new products whose manufacture was undertaken for the first time during the Second Plan period are : super-synthetic enamels for coating of copper wire, finishes for bakelite, luminous paints, lacquer finishes for leather, liquid envelope for protection of precision instruments, ani-pest finishes, cold curved epikote finishes, hot dip protective coatings, level indicating paints, paints capable of withstanding temperatures of the order of 1,500°F., food can lacquers, special adhesives for layer batteries, gasoline-finding paste, synthetic iron oxide pigments and pigment dyestuffs.

Imports and exports.—The total imports and exports of pigments, paints, varnishes and related materials for the last four years are tabulated below :

	Imports (Rs. lakhs)	Exports
1957	175·1	11·9
1958	106·4	11·3
1959	111·3	25·1
1960	164.7	27·5

Practically all the imports consist of raw materials required by the industry. Imports of finished paints and varnishes are negligible. The imports went down in 1958 and 1959 due to the severe restrictions which had to be imposed on all imports on balance of payments considerations.

The rise in exports of paints and varnishes during 1959 and 1960 has been the result of various export promotion measures taken by the Government.

Development Council for the Industry.—A Development Council for the Oil-based and Plastics Industries was constituted in March, 1958 under the Industries (Development & Regulation) Act. It was reconstituted in 1960 and designated as the Development Council for Oils, Soaps and Paints.

II. Programme of Development in the Third Plan:

Estimated requirements.—In assessing the requirements of paints and varnishes in 1960-61 at the time of the formulation of the Second Five Year Plan, the production in the small-scale sector was not taken into account. The Small Scale Industries Organisation of the Ministry of Commerce and Industry carried out a survey of the paint, varnish and lacquer industry in 1957. According to this, the production in the small-scale sector was estimated at about 15,000 tons in 1957. Assuming that this rose to about 18,000 tons in 1960 in line with the trend in the organised sector, the consumption of paints and varnishes including nitrocellulose lacquers in 1960 may be estimated at about 70,000 tons.

The Paint Panel of the Development Council for Oils, Soaps and Paints has estimated the requirements of surface coating materials in 1966 at 160,000 tons. The paint consuming industries have large expansion programmes in the Third Plan. In almost all cases the targets fixed for 1965-66 are more than double of the achievements in the Second Plan. The construction activities are also envisaged to increase considerably during the Third Plan period. In view of these developments, a doubling of the consumption of surface coating materials during the five-year period, 1961-66 is not considered to be excessive. Thus, the requirements of surface coating materials in 1965-66 have been roughly estimated at 140,000 tons.

Targets of capacity and production.—In order to obtain a production of the order of 140,000 tons in 1965-66, a capacity target of 160,000 tons is considered adequate.

Additional capacity required.—In addition to the existing capacity of about 88,000 tons inclusive of nitrocellulose lacquers, only one new scheme namely, M/s. Rathna Paints & Chemicals Ltd., Madras with a capacity of 1,800 tons is at present under implmentation. Assuming the contribution of the small-scale sector at about 30,000 tons in 1965-66, there appears to be scope for licensing an additional capacity of about 40,000 tons for fulfilling the target of 160,000 tons. The industry is at present concentrated in the Calcutta and Bombay regions. Preference should, therefore, be given to other areas in licensing new units, if there are applications.

Investment and employment.—It is roughly estimated that a capital investment of Rs. 2·0 crores will be required during the Third Plan period for achieving the capacity target of 160,000 tons. Its foreign exchange component is estimated at Rs. 20 lakhs.

The additional employment expected from the development of the paints and varnishes industry in the Third Plan is estimated at 5,000.

Requirements of raw materials.—It is difficult to estimate the requirements of raw materials for the production of 140,000 tons of surface coating materials in 1965-66 because (a) they are too numerous and (b) the compositions are being continuously improved by the use of new and varied raw materials. The requirements of the principal raw materials are roughly estimated as follows :

	(tons)
Zinc oxide	13,000
Red lead	13,000
Titanium dioxide	8,000
Aluminium powder/paste	1,600
Synthetic resins (all sorts)	13,000
Nitrocellulose (low viscosity)	525

By the end of the Third Plan period almost all the essential raw materials required by the industry are expected to be available from indigenous sources. Projects have been licensed for the manufacture of pigment dyestuffs, industrial solvents like butly alcohol and butyl acetate, methyl isobutyl ketone, diacetone alcohol as well as basic chemicals like phthalic anhydride, maleic anhydride, formaldehyde, Penta-erithrytol etc.

The following table summaries the development programme for the paints and varnishes industry in the Third Five Year Plan :

	1960-61	1965-66
Capacity ('000 tons)	88*	160
Production ('000 tons)	52·5*	140

*Figures relate to the organised sector only.

51. SOAP AND SYNTHETIC DETERGENTS

A. SOAP

1. Review of progress in the Second Plan:

Targets.—In the Second Plan it was envisaged that the demand of soap would be about 300,000 tons in 1960-61. This estimate implied that the per capita consumption of soap would increase from about 18½ oz. in 1955-56 to 26 oz. in 1960-61, on the basis of the population estimates then being used. No significant exports of soap were considered feasible on account of the high cost of production of soap in India, the restrictions imposed in many countries on the import of soap and the administrative difficulties connected with the remission of the duties on imported raw materials utilised in manufacture exclusively for export. Corresponding to the internal requirements, the production target for 1960-61 was fixed at 300,000 tons. It was envisaged that capacity in the organised sector and the unorganised sector (covering the small scale and the cottage sectors taken together) estimated at 340,000 tons in 1955-56 would be raised to 357,000 tons by the establishment of 600 oil-*cum*-soap production centres in the villages as proposed by the All India Khadi and Village Industries Board.

Capacity.—During the Second Plan, a marginal expansion in capacity was permitted in the organised sector, mainly from the angle of permitting vanaspati manufacturers to instal soap making capacity to the extent of 5% of their vanaspati manufacturing capacity. The details of the additional installed capacity are as follows :

	Number of units	Capacity installed durng the Second Plan (tons)
New Units	2	530
Substantial expansions	1	750
TOTAL	3	1,280

Thus at the end of 1960, the capacity in the organised sector stood at a level of about 255,000 tons. The State-wise distribution of the capacity in the Organised sector is given below :

State	Number of Units	Annual capacity (tons)
1	2	3
Andhra	3	2,872
Assam	..	..
Bihar	1	1,800
Delhi	3	4,800

1	2	3
Gujerat	1	600
Kerala	5	20,235
Madhya Pradesh	4	2,736
Madras	8	9,924
Maharashtra	31	115,558
Mysore	5	4,080
Orissa	..	..
Punjab	3	2,580
Rajasthan	..	..
Uttar Pradesh	6	16,114
West Bengal	21	73,868
TOTAL	91	255,117

Production.—In the large scale sector the production of the different types of soap from 1955 onwards has been as follows :

(in tons)

	1955	1956	1957	1958	1959	1960
Laundry soap	82,250	90,530	91,290	101,730	107,158	113,339
Toilet soap	15,100	17,270	17,700	18,568	19,217	21,057
Medicated soap	300	400	450	510	460	370
Other sorts of soap	1,350	2,050	2,162	2,642	3,165	5,750
TOTAL	99,000	110,250	111,602	123,450	130,000	140,515

Reliable production figures for the unorganised sector are not available. In 1956 it was estimated that the production of this sector at the end of the First Plan period was about 100,000 tons of cheap filled soap equivalent to about 50,000 tons of soap of the strength produced in the organised sector. Subsequently, considerably higher estimates of production by the unorganised sector, though somewhat divergent, have been arrived at independently by the Development Wing and by M/s Hindustan Lever Ltd., as shown below:

(a) Based upon a rough estimate made by the Soap panel in regard to the production of non-power soap during 1957, the Development Wing estimated the current production in the unorganised sector to be of the order of 230,000 tons per annum.

(b) According to a reecnt survey by M/s. Hindustan Lever Ltd., of production in the unorganised sector, it is estimated at about 330,000 tons per annum.

For the purpose of planning the development programme of this industry, the Development Wing's estimate of a production level of about 230,000 tons per annum by the unorganised sector at the end of the Second Plan has been accepted. (On the basis of an estimated 40% T. F. A. content this output would be equivalent to about 160,000 tons of soap of the average strength produced in the organised sector).

The combined output of the two sectors at the end of the Second Plan is thus estimated at about 370,000 tons as against the target of 300,000 tons envisaged.

Imports and exports.—Imports and exports have been negligible throughout the First and the Second Plan periods. Imports have been virtually banned since 1951 with the exception only of certain soaps of germicidal value. Recently, the indigenous pharmaceutical and toilet soap manufacturing establishments have undertaken plans for the manufacture of these special grades of soaps within the country.

Excise duties.—From first March, 1954 the following excise duties have been levied on soap manufactured with the use of power :

(a) Rs. 5·25 to 6·12 per cwt. of household and laundry soap;

(b) Rs. 14 per cwt. of toilet and other soaps.

From March, 1956 the coverage of excise duty was extended to the production of non-power soap, for which standard rates of duties of Rs. 4·5 to Rs. 5·25 per cwt. are charged on a total production beyond 400 tons per year. A reduced rate of 50% of the standard rate is charged on an annual production of 200-400 tons. The above duties are subject to specified reductions in case of soaps of less than standard strength. The exemption limit allowed in the case of non-power soap is 200 tons as against 125 tons of laundry soap and 50 tons of toilet soap allowed in case of the power units. The reported spurt in output of the unorganised sector in recent years could partly be attributed to the competitive advantage stemming from this excise concession.

Import policy for raw materials.—Till the October, 1960-March, 1961 licensing period, block licenses were being issued to the organised soap units for the import of copra, palm oil and tallow (with quantity and value restrictions) on the basis of the 1956 level of consumption of imported fatty raw materials. These block licences permitted the actual users to utilise the full value of the licences regardless of the quantity involved. The policy also provided an opportunity for changing over from expensive cocoanut oil to cheaper palm oil making it possible to enlarge the total tonnage of soap raw materials imported with the same expenditure of foreign exchange.

During the April-September, 1961 period the basis for licensing of imports of fatty raw materials to organised soap units has been changed to the 1959 level of consumption of all vegetable oils and tallow, with *pro rata* cuts from that level in order to accommodate the total expenditure within the available foreign exchange. The policy of issuing block licences is still being maintained. The change of basic year to 1959 will be advantageous to those units which have progressed more during recent years as compared to others and will help them to maintain their progress.

Recovery of by-products.—Glycerine is the major by-product recovered by the organised soap industry. The production of refined glycerine has increased from 2,508 tons in 1955 to 5,692 tons in 1960. (The amount of crude glycerine produced in 1960 was 9,208 tons). The installed capacity for refined glycerine stood at about 10,000 tons on 31st March, 1961. Schemes for installation of an additional capacity of 3,500 tons for production of refined glycerine are under implementation.

Consumption of raw materials.—The principal raw materials of the soap industry are vegetable oils and tallow (incl. also rosin) and caustic soda, sodium silicate, perfumery, etc. The consumption of the various types of oils (incl. rosin) in 1957 by the organised sector for the production of about 112,000 tons of soap was as follows :

	(tons)
Coconut oil	21,000
Palm oil	19,500
Tallow	3,000
Groundnut oil	4,500
Hydrogenated vegetable oil	4,000
Mohwa oil	4,000
Other (approx.) (incl. rosin)	10,000
TOTAL	66,000

II. Programme of Development in the Third Plan :

Estimated requirements.—It is difficult to assess precisely the trend of demand over a five year period for a consumer article like soap as there are a number of uncertain factors influencing its consumption. The uncertainty regarding the actual trends of production within the unorganised sector, which has been referred to before, is one such factor. In addition there are the other normal factors which influence the consumption of most articles such as the trends of growth of national income and its distribution among different classes of the population and the growth of urbanisation and industrialisation. In addition to these factors, allowance has also to be made for substitute materials *e.g.* synthetic detergents, for which the production target

has been set at 20,000 tons for the Third Plan. On the basis of an examination of such data as is available on past trends of soap consumption, it has been assumed that the consumption of soap during the Third Plan will increase roughly in proportion to the national income. Thus, it is estimated that soap consumption will rise to about 500,000 tons by the end of the Third Plan as against the estimated level of 370,000 tons at the end of the Second Plan.

The prospects for achieving significant exports of soap during the Third Plan do not appear to be bright for the same reasons as have been mentioned with reference to the Second Plan.

Targets of capacity and production.—As exports are not expected to be large, the production target has been envisaged in relation to the internal requirements, namely 500,000 tons. It is further envisaged that the relative contributions to the additional production required, over and above the level of 370,000 tons attained at the end of the Second Plan, as between the organised and the unorganised sectors, will be in the ratio of 6 to 4. On this basis the production target for the organised sector is set at 220,000 tons; and for the unorganised sector at 280,000 tons. No additional capacity is envisaged in the Third Plan as the installed capacity of about 255,000 tons in the organised sector exceeds the production target proposed.

Requirements of raw materials.—To achieve the production target of 500,000 tons of soap in 1965-66 the two sectors of the industry will together require the following quantities of the principal raw materials :

	(tons)
Oils and fats	230,000
Rosin	17,000
Caustic soda	40,000

These estimates have been calculated by projecting the combined requirements of the two sectors on the basis of ratios between consumption of materials and soap production in the organised sector only. As, however, in the unorganised sector the relative consumption of caustic soda is likely to be lower and that of rosin higher than in the organised sector, there would be a corresponding error in the above estimates.

In regard to oleaginous material for soap manufacture, technical considerations call for a balance between the use of coconut oil and soft oils on the one hand (these give higher solubility and freer lathering properties to the soap) and hard oils which have more efficient cleansing properties, on the other. From the economic point of view, the main question is the extent to which coconut oil, the most expensive oil, can be replaced by cheaper palm oil. The Soap Panel of the Development Council for Oils, Soaps and Paints has recommened that the consumption of coconut oil should be brought down to a level of about 25% of the total requirements of oils in the case of toilet soaps, and about 20% of the total oils used in the case of laundry soap.

As already mentioned, the total demand for vegetable oils for edible purposes as well as for various industries (principally vanaspati, soap and paints) is expected to increase rapidly during the Third Plan. Two of the important measures envisaged in the Third Plan for enlarging the indigenous supply of vegetable oils are production of cottonseed oil and solvent extraction of oil from oilcake. It appears that the supplies of cotton seed oil are being largely used for manufacture of vanaspati, though small amounts of hydrogenated cottonseed oil are also being used for soap manufacture. It has been suggested in the Soap Panel that central fat-splitting plants should be set up, which would recover glycerine from oleaginous materials and supply free fatty acids to the unorganised sector for soap manufacture. Proposals for setting up such central fat-splitting plants in the private sector will be considered by Government on the basis of indigenous availability of vegetable oils and/or any agreement that may be reached with the unorganised sector in regard to block transfer of import licences for vegetable oils. While the primary objective envisaged in setting up fat-splitting plants is recovery of glycerine, it is expected that these plants may also enlarge the total supply of raw materials for the soap industry by processing low grade fatty materials (*e.g.* soap-stock and some minor oilseeds) which cannot be conveniently utilised by the soap industry.

The requirements of caustic soda for the soap industry at the end of the Third Plan are expected to be covered in full by the target of caustic soda production, which has been set at 340.000 tons. There may be some difficulty in stepping up the indigenous production of rosin in line with the increase in soap production; as rosin is a by-product of the manufacture of turpentine for which currently there is not much demand. However, with the growth of various chemical industries, *e.g.* camphor manufacture, it is possible that the production of turpentine may increase.

The table below summarises the development of the soap industry in the Third Plan :

	1960	1965
Capacity, organised sector only ('000 tons) . . .	255	255
Production ('000 tons)	370	500
Organised Sector	140	220
Unorganised sector	230	280

B. Synthetic Detergents

1. Review of Progress in the Second Plan:

No specific target was set in the Second Plan for manufacture of synthetic detergents. In the "Programmes of Industrial Development—1956-61" it was envisaged that the consumption of synthetic detergents by the end of the Second Plan might be about 10% of the total production of soap. There was no capacity in existence for production of synthetic detergents at the commencement of the Second Plan.

Capacity and Production.—The following two units for manufacture of synthetic detergents have gone into production during the Second Plan period :

Name of Unit	Location	Year of commencing production	Installed capacity (tons)
M/s. Swastik Oil Mills	Bombay .	1957	3,600
M/s. Hindustan Lever	Bombay .	1958	3,600
	TOTAL .		7,200

In addition, the following schemes licensed for manufacture of synthetic detergents were yet to be implemented at the end of the Second Plan:

Name of unit	Location	Installed capacity (tons)
M/s. Tata Oil Mills	Bombay .	3,600
M/s. Kusum Products Ltd.	Calcutta .	900
M/s. Bombay Soap Factory	Bombay .	720
	TOTAL .	5,220

Thus the total capacity licensed by the end of the Second Plan including both the capacity installed and the capacity yet to be implemented was 12,420 tons.

The production of synthetic detergents during each year of the Second Plan since the commencement of indigenous manufacture, has been as follows :

	(tons)		(tons)
1957 . . .	124	1959 . . .	1,293
1958 . . .	264	1960 . . .	1,628

II. Programme of Development in the Third Plan :

Synthetic detergents have made considerable inroads into the market for laundry soap in the industrialised countries. Many of these countries either do not produce vegetable oils or produce them only in limited quantities, whereas raw materials for synthetic detergents are abundantly available as by-products from well established Iron & Steel industries with fully equipped by-product recovery systems; and as by-products of petroleum refineries, with ancillary petrochemical industries. In India also the contribution of the synthetic detergents industry could be valuable in relieving the pressure on the limited internal supplies of vegetable oils which would be required for soap manufacture; particularly if the raw materials for synthetic detergents could be indigenously manufactured. The main limitation in the short run is that the indigenous manufacture of the principal raw material,

dodecyl benzene, does not appear to be economic until its total offtake reaches a certain minimum level. In addition, there is the problem of securing consumer acceptance for a new product, which is likely to be a gradual process and will also depend on the price of synthetic detergents relative to the price of traditional laundry soap.

Estimated requirements and Targets.—The Development Wing of the Ministry of Commerce & Industry have estimated the requirements of synthetic detergents at 20,000 tons by 1965-66. This figure has been accepted as the production target for the Third Plan; and an installed capacity of 20,000 tons by 1965-66 is accordingly envisaged. It could be revised upwards if favourable conditions were to emerge during the plan period for the production of synthetic detergents as a result of bigger developments in the petrochemical field.

Investment.—Installation of the additional capacity *vis-a-vis* the target, inclusive of a capacity of 6,000 tons for dodecyl benzene (the requirements of which would be about 5,000 tons for a production of 20,000 tons of synthetic detergents), would require a fixed investment of about Rs. 3 crores of which the foreign exchange element would be Rs. 1 crore.

Raw Materials.—The major raw materials required for production of 20,000 tons of synthetic detergents are estimated as follows :

Item	Quantity required (tons)	Value (Rs. lakhs)
Dodecyl benzene	5,000	90·0
Sodium phosphate	6,000	76·2
Sodium sulphate	4,000	16·8
Alkanolamide	480	17·5
Other items	258	20·9
TOTAL	15,738	221·4

Among the 4 major items listed above, it is expected that alkanolmide will have to be imported. As regards dodecyl benzene, the basic materials required for its manufacture are propylene, which is a refinery product or by-product, and benzene. In relation to the consumption requirements of dodecyl benzene by the end of the Third Plan, which are estimated to be capable of providing an economic base for its indigenous production, it is necessary to bring into existence a plant for manufacturing this major raw material of the detergents industry.

The following table summarises the programme of development of the industry envisaged during the Third Plan :

	('000 tons)	
	1960-61	1965-66
Capacity	7,200	20,000
Production	1,628	20,000

52. STARCH AND GLUCOSE

A. STARCH

I. Review of Progress in the Second Plan :

Targets.—The Planning Commission estimated that the requirements for starch inclusive of exports of 10,000 tons would rise to 100,000 tons per annum by 1960-61. Corresponding to this demand the targets of capacity and production for 1960-61 were envisaged at 100,000 tons.

Capacity.—According to the 1955 Tariff Commission's Report on starch industry, there were at the beginning of the Second Plan 10 starch factories in active production with an aggregate annual installed capacity of about 77,600 tons.

During the Second Plan period the capacity of the industry was reassessed by the Office of the Textile Commissioner. The latest position at the end of the Second Plan was that there were 7 starch factories in active production with a total annual installed capacity of 148,600 tons. The location and annual installed capacity of each of these factories are indicated below :

Name of the Unit	Location	Annual installed capacity (tons)
M/s. Maize Products	Ahmedabad (Gujarat)	54,000
M/s. Anil Starch Products	Do.	60,000
M/s. Bharat Starch & Chemicals Ltd.	Yamunanagar (Punjab)	12,600
M/s. Hyderabad Construction Co. Ltd.	Hyderabad (Andhra Pradesh).	6,000
M/s. Sukhjit Starch & Chemicals	Phagwara (Punjab)	6,000
M/s. Gwalior Maize Products	Mandsaur (Madhya Pradesh).	4,000
M/s. Laxmi Starch Factory Ltd.	Kundara (Kerala)	6,800
	TOTAL	148,600

Of these, the first 6 units were manufacturing maize starch from imported maize whereas the last unit *viz.*, M/s. Laxmi Starch Factory was producing tapioca starch from topioca roots grown locally.

Production.—The production of starch in the last six years has been as under:

(tons)

	Maize starch	Tapioca starch	Total
1955	41,297	2,135	43,432
1956	46,301	3,030	49,331
1957	52,799	2,874	55,673
1958	53,140	2,583	55,723
1959	62,541	3,657	66,198
1960	64,877	3,600	68,477

Although the production of starch showed a steady increase during the Second Plan period the production target of 100,000 tons by 1960-61 could not be achieved partly because the anticipation regarding exports did not materialise and partly on account of shortage in the supplies of raw materials. The offtake of the textile industry also did not come up to expectations on account of the shortfall in cloth production.

Imports and exports.—Starch is at present not allowed to be imported. The quantities of starch imported during the Second Plan period were negligible.

An export target of 10,000 tons was envisaged to be achieved by the industry by 1960-61. This optimistic view on exports was taken on the basis of the reduced price of maize prevailing at that time and the possibility of a scheme with foreign collaboration and with a definite export programme materialising in Kerala. This scheme did not go forward. The improved position regarding price and supply of maize also proved to be temporary As a result, exports have been practically negligible. Separate figures for export of starch are not available. The total quantity and value of starch, starchy substances and dextrine exported from India in the last few years are given in the table below:

	Quantity (tons)	Value (Rs.)
1957	30·7	9,736
1958	132·4	61,455
1959	4,178·5	1,017,050
1960	678·75	181,267

Consumption.—The imports and exports of starch have been negligible during the Plan period. The actual consumption may therefore be considered approximately to correspond to production of starch in the country. On this basis it is estimated that the domestic consumption of starch has increased from about 43,400 tons in 1955 to 68,500 tons in 1960.

Investment.—A sum of about Rs. 1·5 crores is estimated to have been invested in the starch industry during the Second Plan period.

Major developments in the industry.—Gluten, an important by-product of the starch industry, was exported in large quantities during the Second Plan period. The industry has also started producing adequate quantities of glucose and dextrose powder to meet the indigenous demand fully.

Problems of the industry.—Difficulties are being experienced by the starch industry in procuring adequate quantities of its raw material *viz.*, maize. Owing to food shortage in the country, the use of indigenous maize is not allowed for the production of starch. The industry has therefore to depend entirely on the imports of maize for which arrangements are made from U.S.A. under PL 480. Due to the limited availability of maize, the industry has been working far below its installed capacity.

Obsolescence of machinery is another major deterrent factor in the economic production of starch. Due to the acute foreign exchange position, it has not been possible to earmark substantial amounts for the import of the latest types of machinery for renovation and expansion. It has also not been possible to make adequate provisions for the import of essential spares for the maintenance of the existing machinery.

The industry is also finding it difficult to export starch due to high sea freight rates. In addition, maize starch is not placed in the free list of exportable commodities because the industry is entirely dependent on imported raw materials.

II. Programme of Development in the Third Plan :

Estimated requirements.—The consumption of starch in 1960-61 is estimated to have been about 68,000 tons. With the increasing industrial expansion during the Third Plan, the demand for starch is expected to increase considerably by the end of the Third Plan period. It is estimated that the demand for starch will be of the order of 120,000 tons per annum by 1965-66 on the following basis :—

(a) *Demand from the cotton textile industry.*—The major demand for starch in the country is from the cotton textile industry which accounts for the consumption of more than 80% of the present production. The total production of all varieties of cotton cloth is estimated to go upto 9,300 million yards by 1965-66. The present consumption of starch for a production of about 7,300 million yards of cloth (mill-made, handloom and powerloom) is estimated to be of the order of 60,000 tons. If the target of 9,300 million yards visualised by 1965-66 is achieved, the likely demand for starch on a *pro rata* basis would be about 76,000 tons.

(b) *Demand from the paper industry.*—The production of paper and paper board is expected to be about 700,000 tons by 1965-66. In the year 1960-61 the consumption of starch is estimated to have been about 6,000 tons when the production of paper and paper-board was about 345,000 tons. On a proportionate basis, the demand for starch from this industry would be of the order of 12,000 tons by 1965-66.

(c) *Demand from the jute industry.*—No substantial increase in the production of jute during the Third Plan period is envisaged. The requirements of starch by the jute industry may therefore be assumed to continue at the present level of 3,000 to 3,500 tons by 1965-66.

(d) *Demand from the glucose industry.*—The present demand for starch by the glucose industry for a production of 11,000 tons is estimated to be about 11,000 tons. It is estimated that the production of both glucose and dextrose by the end of the Third Plan would be about 24,000 tons. The requirements of starch for the glucose industry on a proportionate basis would therefore be about 24,000 tons by 1965-66.

In addition some increase in the consumption of starch can be expected from the cosmetic and pharmaceutical industries; such requirements are however small and are not likely to result in any substantial variations in the total demand of starch.

(e) *Demand from exports.*—The future prospects of exports on present reckoning do not seem to be bright partly because of the industry's dependence on imported raw material and partly because of the unfavourable sea freight rates. However, in view of the need for expanding exports for earning foreign exchange, determined efforts may have to be made to stimulate exports under this industry too. Assuming such efforts are forthcoming it may be possible to export about 5,000 tons of starch by 1965-66.

Schemes licensed and under implementation.—Licences under the Industries Act have been given for the expansion of capacity in the case of the following schemes :

(i) M/s. Laxmi Starch Factory have been given a licence to set up a second unit at Kozhicode Dist., in Kerala State for the manufacture of tapioca starch with an annual capacity of 6,600 tons.

(ii) M/s. Kamala Sugar Mills who have recently gone into production for the manufacture of glucose have been given a licence for expanding their undertaking for the manufacture of 3,000 tons per annum of starch from tapioca.

Additional Capacity.—With the implementation of the above schemes the annual capacity of the starch industry will increase to about 158,200 tons. This capacity is considered to be more than adequate to meet the

anticipated demand by 1965-66. It does not therefore seem necessary to expand the capacity of the industry further during the period of the Third Plan.

Investment.—It is estimated that a sum of about Rs. 5 crores will be invested in the starch and glucose industry during the Third Plan period to achieve the capacity targets envisaged for these industries.

Requirements of raw materials.—Maize is the main raw material used for the production of starch. Tapioca roots are also used to a limited extent by factories in the South. The other raw materials required for the manufacture of starch are sulphur and other chemicals. These are however required only in small quantities.

Maize is at present imported. Until the production of maize improves, it may have to be continued to be imported for the production of starch.

The following table summarises the development programme of the starch industry envisaged during the Third Plan :

	1960-61 (tons)	1965-66 (tons)
Installed capacity	148,600	158,200
Production	68,477	120,000
Domestic consumption	68,477	115,000
Export	Neg.	5,000

B. GLUCOSE

I. Review of Progress in the Second Plan :

Targets.—The Planning Commission envisaged that the capacity for liquid glucose would increase from 9,100 tons in 1955-56 to 13,000 tons by the end of 1960-61. The capacity for dextrose powder (glucose powder) was expected to increase from 2,600 tons to 7,700 tons in the same period.

The demand for liquid glucose which was estimated at 3,500 tons in 1955-56 was expected to rise to 5,000 tons and that for dextrose powder from 1,800-2,000 tons to 2,800 tons in 1960-61. The full requirements were expected to be met from indigenous sources and therefore production targets of 5,000 tons for liquid glucose and 2,800 tons for dextrose powder were fixed to be achieved by the end of the Plan period.

Capacity.—In April 1956 there were 3 units manufacturing gluose with an annual capacity of 9,100 tons of liquid glucose and 2,600 tons of dextrose powder. Since then another new unit M/s. Kamala Sugar Mills Ltd., Udamalpet has gone into production with a total combined annual capacity of 1,500 tons of liquid glucose and dextrose powder. Further M/s. Anil Starch Products have installed a composite unit for the manufacture of

both liquid glucose and dextrose powder. As a result their capacity has increased to 5,400 tons of liquid glucose and 1,800 tons of dextrose powder. Thus, there were at the end of the Second Plan 4 units with a total combined capacity of 17,200 tons of liquid glucose and dextrose powder, capable of producing 12,900 tons of liquid glucose and 4,300 tons of dextrose powder or alternatively 11,400 tons of liquid glucose and 5,800 tons of dextrose powder respectively. The individual capacities of the existing units are indicated below:

	Liquid glucose (tons)	Dextrose powder (tons)
M/s Anil Starch Products, Ahmedabad	5,400	1,800
M/s. Maize Products, Ahmedabad	6,000	1,500
M/s. Glucose & Foods, Kurla	..	1,000
M/s. Kamla Sugar Mills, Udamalpet	1,500*	..
TOTAL	12,900	4,300

*This is not additive but alternative capacity in dextrose.

Production.—The production of liquid glucose and dextrose powder during the last five years has been as given below:

(tons)

	Liquid glucose	Dextrose powder
1956	1,044	25
1957	3,361	542
1958	4,410	1,653
1959	6,430	2,404
1960	8,690	2,560

The production of both liquid glucose and dextrose powder steadily increased during the Second Plan period. The production target for 1960-61 for liquid glucose was exceeded by a considerable margin in 1959 and 1960.

Consumption.—The estimated consumption of glucose during the Second Plan on the basis of production plus imports (exports have been insignificant) has been as shown in the table below:

(tons)

	Liquid glucose			Dextrose powder		
	Production	Imports	Quantity available for consumption	Production	Imports	Quantity available for consumption
1956 . . .	1,044	1,661*	2,705	25	†	N.A.
1957 . . .	3,361	1,076	4,427	542	100	642
1958 . . .	4,410	69	4,479	1,663	neg.	1,662
1959 . . .	6,430	114	6,544	2,404	17	2,411
1960 . . .	8,690	9	8,699	2,560	292	2,852

*Includes both liquid glucose and dextrose powder.

† Data on imports of dextrose not available separately.

Quality.—Liquid glucose manufactured in the country compares favourably with the imported variety. The quality of dextrose powder manufactured in India is also considered to be satisfactory and is generally in conformity with the B. P. Standards.

Problems of the industry.—The industry has represented that indigenous activated carbon requires further improvement so as to be acceptable to the glucose industry.

II. Programme of Development in the Third Plan:

Estimated requirements: (i) *Liquid Glucose.*—The present consumption of liquid glucose is estimated to be about 8,700 tons. Liquid glucose is used in the manufacture of confectionery upto nearly 33% of the weight of the finished product. It is also used as an ingredient in the manufacture of biscuits, ice cream and pharmaceuticals. The annual production of confectionery is estimated at 25,000 tons by the end of the Third Five Year Plan. On this basis the demand for liquid glucose by the confectionery industry will be about 8,000 tons. The annual demand for liquid glucose by other food industries and the pharmaceutical industry is expected to be 6,000 tons. An important industrial outlet, though small in term of tonnage, is related to its use in the manufacture of sorbitol, the intermediate raw material for the synthesis of vitamin-C. The total demand for liquid glucose by 1965-66 is estimated to be 14,000 tons per annum.

(ii) *Dextrose powder.*—At present the demand for dextrose powder is about 3,000 tons. It is estimated that the demand for dextrose powder will increase considerably during the Third Plan period on account of its increased use in the manufacture of pharmaceuticals. On the basis of an estimated increase of 25% per annum during the Third Plan period the demand for dextrose powder is likely to go up to 10,000 tons by 1965-66.

Schemes licensed and under implementation.—The following schemes are under various stages of implementation :

1. M/s. Anil Starch Products have been licensed for doubling their capacity for the manufacture of dextrose powder from 1,800 tons to 3,600 tons per annum.

2. M/s. Maize Products Ltd., have been given a licence for the expansion of their unit for the manufacture of dextrose powder from 1,500 tons to 6,000 tons per annum.

3. M/s. Laxmi Starch Factory have been given a licence for setting up a new unit at Kozicode for the manufacture of starch, glucose, dextrose etc. based on tapioca. The capacity for the manufacture of liquid glucose is estimated at 3,00 tons per annum.

4. M/s. Kamala Sugar Mills who have recently gone into production for the manufacture of glucose have recently been permitted to expand their capacity for the manufacture of 312 tons per annum of dextrose powder based on tapioca.

Additional Capacity.—With the implementation of the schemes mentioned above, the annual capacity of the industry for the manufacture of liquid glucose and dextrose powder will increase to 15,900 tons and 10,912 tons respectively. This capacity is considered to be adequate to meet the anticipated demands by 1965-66. It does not therefore seem necessary to expand the capacity of the industry further during the period of the Third Plan. However, since anhydrous dextrose powder is not so far manufactured in the country, it would be desirable to develop indigenous capacity for this product which is in demand for the manufacture of injectibles and pharmaceutical products.

Requirements of raw materials.—The main raw materials required in the manufacture of glucose is pure starch. In addition, hydrochloric acid or sulphuric acid, soda ash, mineralising agents and activated carbon are also used. All these raw materials are expected to be available indigenously.

The following table summarises the development of the glucose industry envisaged during the period of the Third Plan :

	1960-61		1965-66	
	Annual installed capacity	Production	Annual installed capacity	Production
Liquid glucose (tons)	12,900	8,690	15,900	14,000
Dextrose powder (tons)	4,300	2,560	10,912	10,000

53. RUBBER MANUFACTURES

I. Review of Progress in the Second Five Year Plan:

The rubber goods manufacturing Industry produces a variety of goods which may be broadly classified into the following groups:—

1. Automobile Tyres and Tubes.
2. Bicycles Tyres and Tubes.
3. Other rubber Manufactures.

The group 'other rubber manufactures' includes items such as footwear, V-belts, rubber conveyer belts, vaccum brake hoses, foam cushions and tennis balls, etc.

Automobile tyres and tubes:

Capacity.—At the time of the formulation of the Second Plan, there were two units manufacturing automobile tyres and tubes with a yearly capacity of 1·048 and 1·071 million numbers respectively. It was envisaged that the installed capacity of automobile tyres and tubes would increase to 1·46 million numbers of three shift basis by 1960-61.

During the Second Five Year Plan Period, a new factory has been set up in February, 1959 by M/s. Dunlop Rubber Company of India at Ambattur, near Madras with an installed capacity of 134,400 numbers of automobile tyres. This factory is producing only giant tyres in a few popular sizes and that of bicycle tyres. In order to streamline their production M/s. Dunlops have recently been permitted to transfer from thier Sahaganj unit to the Ambattur plant, giant tyre capacity to the extent of 23,600 nos. per year. Further, the company expanded the capacity of their Sahaganj factory by 22,800 nos. during the year 1958-59. M/s. Firestone Tyre and Rubber Company, Bombay also expanded their capacity for automobile tyres by 252,000 numbers with effect from 1958-59. In 1960-61, a new unit was established in Bombay by M/s. Ceat Tyres of India Ltd., with a capacity of 150,000 numbers.

Thus the installed capacity of automobile tyres at the end of the Second Five Year Plan stood at 1·608 million numbers per annum on three shift basis.

In the case of automobile tubes the installed capacity has risen from 1·071 millions to 1·661 millions in 1961 on three shift basis. This increase has been the result of substantial expansions carried out by the two existing units and establishment of a new unit in 1960-61 at Bombay, with a capacity of 150,000 tubes.

The schemes which have been completed during the Second Plan period are as under :

	Nature of the scheme	Nos.	Year of completion
M/s. Firestone Tyres & Rubber Co. of India, Bombay	(S.E.)	252,000	1958-59
M/s. Dunlop Rubber Company of India, Sahaganj	(S.E.)	188,400	1959-60
M/s. Ceat Tyres of India Ltd., Bombay	(N. U.)	150,000	1960-61
TOTAL		590,400	

The statewise distribution of the automobile tyres and tubes industry at the end of the Second Plan was as follows :

State	No. of units	('000 nos.) Annual Installed capacity	
		Tyres	Tubes
West Bengal	1	652	839
Bombay	2	822	822
Madras	1	134	..
TOTAL	4	1,608	1,661

Production.—The actual production of automobile tyres and tubes for trucks, cars, motor cycles, tractors, aeroplanes and earthmoving equipment during the Second Plan period was as follows:

	Tyres (nos.)	Tubes (nos.)
1955-56	921,869	818,783
1956-57	996,725	1,003,992
1957-58	1,031,969	957,311
1958-59	1,060,162	1,005,050
1959-60	1,233,955	1,226,125
1960-61	1,491,052	1,410,729

The data shows a consistent and continuous rise in the output of these products over the five year period except a slight fall in the case of tubes in the year 1957-58.

Imports and Exports.—The imports of pneumatic tyres and tubes for aeroplances, motor cars, motor cycles, trucks, tractors and earth moving equipment since 1956 have been as follows :

	Tyres		Tubes	
	(nos.)	value (Rs. lakhs)	(nos.)	value (Rs. lakhs)
1956	80,977	148·6	22,924	4·2
1957	80,963 (73,827)	185·8	84,912 (78,200)	22·9
1958	77,820 (74,064)	105·6	37,544 (34,653)	6·1
1959	22,787 (14,458)	59·0	24,771 (20,608)	4·3
1960	44,362 (34,365)	120·1	45,463 (38,512)	12·8

The figures in brackets ind cate the import of automobile tyres and tubes only. (*i.e.*, for motor cars, motor cycles, trucks and buses).

As a result of a liberal licensing policy adopted in 1956 the imports of tyres increased considerably during 1957. Since then, due to the tight foreign exchange position, restrictions had been imposed and the imports were reduced to the bare minimum. In the year 1960 imports of tyres have been only 44,362 numbers as against 80,963 numbers in 1957. In the same way the imports of automobile tubes have fallen to 45,463 numbers in the year 1960 as against 84,912 in 1957.

Exports of tyres and tubes for aeroplanes, motor cars, motor cycles, buses/trucks, tractors and earthmoving equipment during the Second Plan period have been as follows:

	Pneumatic Tyres		Pneumatic Tubes	
	(nos.)	value (Rs. lakhs)	(nos.)	value (Rs. lakhs)
1956	26,440 (25,697)	30·5	20,239 (19,701)	3·0
1957	6,005 (5,498)	4·9	4,140 (3,860)	0·37
1958	13,679 (12,922)	9·7	12,155 (11,441)	1·08
1959	10,622 (10,073)	9·1	10,288 (9,227)	0·92
1960	6,634 (6 123)	6·95	4,134 (4,077)	0·6

• The figures in brackets indicate the exports of automobile tyres and tubes only

These exports are confined mostly to Bahrein, Kuwait, Pakistan, Ceylon, Singapore, Iran and Nepal. The exports have fallen substantially since 1956 owing to the high pressure of internal demand.

The export target of 150,000 numbers of automobile tyres and tubes laid down in the Second Plan has not been achieved.

Availability.—The total availability of automobile tyres and tubes for aeroplanes, motor cars, motor cycles, buses and trucks, earth moveing equipments on the basis of domestic production plus imports minus exports during the period of the Second Plan is summarised in the tables below :

(numbers of tyres)

	Production	Imports*	Exports*	Quantity available for consumption	As estimated in the Plan
1955-56	921,869	12,297	61,868	872,298	..
1956-57	996,725	80,977	26,440	1,051,262	..
1957-58	1,031,969	80,963	6,005	1,106,927	..
1958-59	1,060,162	77,820	13,679	1,124,303	..
1959-60	1,233,955	22,787	10,622	1,246,120	..
1960-61	1,491,052	44,362	6,634	1,528,780	1,310,000

*The figures of import and export are in calendar year except for 1955-56.

Besides this, the country imported solid tyres for motor vehicles to the extent of 2,359 numbers valued at Rs. 3·4 lakhs in 1957, 2,826 numbers valuing Rs. 6·4 lakhs in 1958, 618 numbers valuing Rs. 1·0 lakh in 1959 and 15,733 numbers valuing Rs. 38·1 lakhs during the year 1960.

(numbers of tubes)

	Production	Imports*	Exports*	Quantity available for consumption	As estimated in the Plan
1955-56	818,783	9,960	31,137	797,606	..
1956-57	1,003,992	22,924	20,239	1,006,677	..
1957-58	957,311	84,912	4,140	1,038,083	..
1958-59	1,005,050	37,544	12,155	1,030,439	..
1959-60	1,226,125	24,771	10,288	1,240,608	..
1960-61	1,410,729	45,463	4,134	1,452,058	1,310,000

*The figures of import and export are in calendar year except for 1955-56

The availability of tyres is estimated to have increased by about 75 per cent during the Second Plan period. In the case of automobile tubes, the rise in the availability during the first year of the Second Plan is very nominal but it increased by about 80 per cent by the end of the Second Five Year Plan.

Due to import restrictions, there is not as much improvement in the availability of automobile tyres as was warranted by the growth of demand. The result has been that there was considerable pressure on available supplies with an upsurge in price. The position regarding automobile tubes was not so tight.

Price and Excise duty.—The Tariff Commission which completed its first enquiry regarding the prevailing prices for tyres and tubes in 1955, estimated the fair prices of different types of tyres and tubes and recommended that those prices should remain in force till December, 1957. The prices prevailing before fixation of fair prices and afterwards were as follows :

	Price before the fixation of fair prices	Price after the fixation of fair prices	Price on 1-4-57	Price on 1-4-58	Price on 1-4-59	Price on 1-4-60	Price on 1-4-61
	Rs. as.	Rs. as.	Rs.	Rs.	Rs.	Rs.	Rs.
Dunlop Fort A cover 5·76 7·00 16·6. Ply.	108 3	96 12	96·74	96·74	104·20	104·20	107·27
Dunlop Giant covers Roadster 7·00—20.	256 0	228 13	228·81	228·81	246·36	246·36	253·82
Dunlop Motor Tubes 5·25–16.	11 13	10 1	10·09	10·09	10·97	10·97	11·41
Dunlop Giant Tubes 6·00–20.	17 9	15 13	15·80	15·80	17·11	17·11	17·55
Dunlop Cycle Covers .	4 6	3 15	3·93	3·93	3·93	4·02	4·14

Bicycle Tyres and Tubes :

Capacity.—At the beginning of the Second Five Year Plan, there were six units engaged in the manufacture of bicycle tyres in the country with an installed capacity of 6·87 million numbers. During the Second Plan period four new units one each in West Bengal, Bombay, Kerala and Madras came into production and three existing units carried out substantial expansions. One of the new units later on carried out expansion

as well. The new units installed and the units which carried out substantial expansions during this period are :

Name of the Unit	Nature of the scheme	Location	Capacity (million nos.)	Year of establishment or expansion
M/s Dunlop Rubber Co. of India Ltd.	(S.E.)	Sahaganj, (West Bengal).	1·925	1959
M/s National Rubber Manufacturing	Do.	Calcutta . . .	2·400	1960
M/s Associated Rubber & Plastic Works	(N.U.)	Chowringhee, Calcutta.	0·720	1960
M/s Premier Rubber & Cable Industries Works	Do.	Bombay . .	0·900	1959
M/s Ruby Rubber Works . .	Do.	Changana Cheery, Kerala.	0·900	1960
M/s Dunlop Rubber Co. of India Ltd.	Do.	Ambattur, Madras .	1·500	1960
M/s Dunlop Rubber Co. of India	(S.E.)	Do.	0·300	1961

With the implementation of the above schemes the installed capacity rose to 15·715 million numbers. In the year 1958-59, M/s. Firestone Tyres and Rubber Co., of India Ltd., Bombay sold a part of their plant for the manufacture of cycle tyres and tubes with a capacity of 0·6 and 0·37 million numbers respectively to M/s. Imperial Tyres and Rubber Co., Bombay. Thus the effective capacity of bicycle tyres stood at 15·115 million numbers on three shift basis at the end of the Second Plan.

There were five units with a total capacity of 8·245 million numbers of bicycle tubes at the beginning of the Second Five Year Plan. During the period of the Plan three new units, one each in West Bngal, Bombay and Kerala came into production. Two existing units carried out substantial expansion during the same period. The schemes completed are:

Name of the Unit	Nature of the scheme	Location	capacity (million nos.)	Year of establishment or expansion
M/s Dunlop Rubber Co. (India) Ltd.	(S.E.)	Sahaganj (West Bengal)	5·454	1960
M/s Associated Rubber & Plastic Works	(N.U.)	Calcutta . . .	0·360	1960
M/s Premier Tyre and Cable Industries	Do.	Bombay . . .	0·900	1959
4. Ruby Rubber Works Ltd.	Do.	Changana Cheery, Kerala.	0·900	1960
5. National Rubber Manufacture Ltd.	(S.E.)	Calcutta . . .	1·200	1960

With the completion of the above schemes and the closing down of the factory of M/s. Firestone Tyre and Rubber Co., of India Ltd., Bombay, having a capacity of 0·37 million nos. the effective capacity of bicycle tubes was 16·689 million numbers on three shift basis at the end of the Second Plan.

The State-wise distribution of the industry was as follows by the end of the Second Plan :

State	No. of units	Annual Installed capacity Tyres (million nos.)	Tubes (million nos.)
W. Bengal	5	11·007	14·214
Bombay	1	0·900	0·900
Kerala	2	1·208	1·575
Madras	1	2·000	..
TOTAL	9	15·115	16·689

Production.—The production of bicycle tyres and tubes since 1955-56 has been as follows :

	Tyres (million nos.)	Tubes (million nos.)
1955-56	5·80	5·69
1956-57	6·63	6·59
1957-58	7·08	7·21
1958-59	7·72	8·22
1959-60	9·83	10·52
1960-61	11·15	13·26

From the above figures it can be seen that the indigenous production of bicycle tyres increased by 92 per cent during the Second Plan period. During the same period the production of bicycle tubes has increased by 133 per cent.

Imports.—The imports of bicycle tyres and tubes during the Second Plan period have been as follows :

	Bicycle Tyres		Bicycle Tubes	
	million nos.	Value (Rs. lakhs)	million nos.	Value (Rs. lakhs)
1956	0.281	13·29	0·218	4·20
1957	0·602	27·60	0·073	1·60
1958	0·661	26·10	0·403	4·60
1959	0·037	1·26	0·125	1.37
1960	0·044	1·45	0·932	11·52

The fall in imports during 1959 and 1960 was due to tight foreign exchange position. There is at present no gap between demand and availability of bicycle tyres. The position of bicycle tubes is similar.

Exports.—The exports of bicycle tyres and tubes during the Second Plan period have been as follows:

	Bicycle Tyres		Bicycle Tubes	
	nos.	Value (Rs. lakhs)	nos.	Value (Rs. lakhs)
1957	6,745	0·26	897	0·02
1958	..	..	..	..
1959	107,453	2·79	550	0·01
1960	492,310	12·27	6,600	0·15

The exports of bicycle tyres and tubes were negligible uptil 1958 due to unsatisfied internal demand. Exports of bicycle tyres proved quite promising since 1959 and the exports reached 492,310 during 1960 as against an export target of 300,000 numbers laid down for the Second Plan. The exports of bicycle tubes have lagged much behind the export target.

Availability.—The total number of bicycle tyres and tubes available for consumption from imports and indigenous production after taking account for exports, during the Second Plan period are summarised in the table below :

(million nos. of tyres)

	Production	Imports*	Exports*	Quantity available for consumption	As estimated in the Plan
1955-56	5·800	0·017	0·064	5·753	..
1956-57	6·630	0·281	..	6·911	..
1957-58	7·080	0·602	0·007	7·675	..
1958-59	7·720	0·661	..	8·381	..
1959-60	9·830	0·037	0·107	9·760	..
1960-61	11·150	0·044	0·492	10·702	11·800

*The figures of imports and exports are in calendar year except for 1955-56.

(million nos. of tubes)

	Production	Imports*	Exports*	Quantity available for consumption	As estimated in the Plan
1955-56	5·690	0·018	0·050	5·658	..
1956-57	6·590	0·218	Neg	6·808	..
1957-58	7·210	0·073	Neg	7·283	..
1958-59	8·220	0·403	..	8·623	..
1959-60	10·520	0·125	Neg	10·645	..
1960-61	13·260	0·932	0·006	14·186	11·800

*The figures of imports and exports are in calendar year except for 1955-56.

The availability of bicycle tyres and tubes increased by 70 and 86 per cent respectively in 1959-60 and by about 87 and 150 per cent respectively by the end of the Second Plan. The availability of tyres was short of actual requirements during the first half of the plan period as the imports were kept to a minimum due to the stringency of foreign exchange. Thereafter the supply position rapidly improved due to increased internal production and by the end of 1959 the production was slightly in excess of domestic demands.

Investment and Employment.—It is estimated that during the period of the Second Plan, an investment of the order of Rs. 12·0 crores has been made in the rubber manufactures industry. The foreign exchange element of this investment is estimated to be about Rs. 7·0 crores. The number of persons employed in the industry is estimated to be 27,370 by the end of 1960.

Problems of the Industry.—Although the supply position with regard to raw materials was generally satisfactory, there was an increase in the cost of materials and stores. Besides, the position of raw rubber has been steadily deteriorating. While consumption by the manufacturing industry increased, indigenous production of rubber lagged behind with the result that the gap between offtake by the industry and output of the plantations has been widening.

Tariff Commission and Raw Rubber Prices.—As a result of several representations from the industry, Government instituted an enquiry through the Tariff Commission on the question of revision of natural rubber prices. The Commission reviewed the progress of the industry in recent years in

regard to new plantings as well as replanting of rubber and stated that the overall area under ordinary seeding was still predominantly large and that the share of the small growers has increased considerably. In view of the need for accelerated production of additional quantitites of rubber to meet the growing internal demands of the manufacturing industry, Government have maintained the statutory price of the raw rubber without any change although the Tariff Commission suggested a slight reduction.

II. Programme of Development in the Third Plan :

Automobile tyres and tubes :

Estimated Requirements.—The demand for automobile tyres and tubes arises from two sources—replacement demand and the demand for original equipment. The replacement demand will depend on the number of vehicles on the road at the end of the plan period. According to the latest estimates available, the numbers of vehicles on the road by 1960-61 were as follows :

	Nos.
Jeeps, Cars and Station wagons	236,000
Trucks & Buses	204,000
Motor cycles	34,000
Scooters	24,500
Tractors	23,000
TOTAL	521,500

Assuming the rate of replacement for giant tyres as 5·5 per vehicle per year : for cars as 1·5 per vehicle per year; scooters 1·5 per vehicle per year; and for tractors one per vehicle per year : the estimated demand by 1960-61 was as under, taking into account the retreating of tyres at 20 per cent for buses & trucks and 15 per cent for cars, jeeps and station wagons :

Cars/Jeeps/Station Wagons	300,900
Trucks and Buses	897,600
Motor cycles	17,000
Scooters	36,750
Tractors	23,000
TOTAL	1,275,250

The demand for original tyres and tubes depends on the production of automobiles. The production of automobiles, motor cycles and scooters and tractors and the requirements for tyres for 1960-61 was expected to be as follows :

	Production 1960-61 (nos.)	No. of tyres required for each vehicle	Total requirements for tyres (nos.)
Buses/Trucks	28,000	7	196,000
Cars/Jeeps/Station Wagons	25,500	5	127,500
Motor Cycles	4,000	2	8,000
Scooters	12,000	2	24,000
Tractors	2,000	4	8,000
	TOTAL		363,500

Adding exports of 6.000 nos. and estimated Government purchases by D.G.S&D. of the order of 100.000 nos. to the above estimated demands on account of replacements and original equipment, the overall requirements was 1·74 million nos. during 1960-61.

The demand for automobile tyres and tubes during the Third Plan period has necessarily to be closely related to the programme of development envisaged for the automobile industry. For the Third Five Year Plan, the production targets of different types of automobiles are placed at 1·60 lakhs including tractors, motor cycles and scooters.

The annual requirements of automobile tyres and tubes as original equipment are to be calculated on the same assumption as have been made in assessing the demand for 1960-61. These are given below:

	production target for 1965-66 (nos.)	Type of tyre	Requirements of tyres and tubes for 1965-66 (nos.)
Cars and Station Wagons	30,000	Passenger	150,000
Trucks	60,000	Giant	420,000
Jeeps	10,000	Jeep	50,000
Tractors	10,000	Tractor	40,000
Motor cycles and scooters	50,000	Motor cycles and scooters	100,000
		TOTAL	760,000

Thus the overall requirements for new vehicles would be 0·760 million numbers by 1965-66.

The replacement requirements of automobile tyres and tubes depend on the number of vehicles on the road. On the basis of the phased programme laid down for the Automobile Industry, it is estimated that 922,000 vehicles will be on the road in 1965-66. Taking the annual rate of replacement for giant tyres as 5·5 per vehicle, for cars, jeeps and station wagons as 1·5 per vehicle, for motor cycles 0·5 per vehicle, for scooter 1·5 per vehicle, and for tractors as one per vehicle, the total replacement requirements in 1965-66 are estimated to be as follows taking into account the retreading of tyres at 20 per cent for buses and trucks and 15 per cent for cars and jeeps and station wagons :

	Nos.
Giant tyres	1,231,000
Motor, jeep, and station wagon tyres	370,800
Motor cycle covers	43,000
Scooters	176,000
Tractors	76,600
TOTAL	1,987,400

Thus the total requirements for replacement purpose would be 1·987 million numbers. Therefore the total internal demand covering the needs of original equipment and replacement could be reckoned as 2·75 million numbers. Adding to this, Government purchases of 100,000 numbers and export requirements of 150,000 numbers, the total production would have to be 2·997 million or 3·0 million numbers of tyres. The demand for automobile tubes can also be taken to be approximately the same. On the basis of 85 per cent production efficiency capacity target for the Third Plan should be 3·7 millions.

Additional Capacity.—The installed capacity for automobile tyres stood at 1·608 millions by the end of 1960-61. There are seven schemes with a capacity of 1·33 million numbers, which have been licensed or recommended for licence. Out of this, a capacity of about 630,000 nos. has been covered by import licences for plant and equipment. On the implementation of these schemes the capacity of automobile tyres is expected to stand at 2·94 million numbers. In order to bring the installed capacity to 3·7 million numbers, additional capacity of 0·76 million numbers needs to be created.

In the case of automobile tubes, the capacity stood at 1·66 million numbers at the end of the Second Plan. Further capacity of the order of 1·34 million numbers is licensed or recommended for licence. Out of this a capacity of about 602,000 nos. has been covered by import licences for

plant and equipment. After the completion of the schemes the capacity is expected to be 3·0 million numbers. There is need for creating an additional capacity of 0·7 million nos. in this line of manufacture.

In view of the importance of this industry for the national transport economy and the difficulties associated with an accurate forecast of demand for automobile tyres and tubes the targets may have to be reviewed in about two years.

Investment.—The existing capacity along with additional capacity for which licences have been issued or under issue is about 2·94 million numbers for tyres and 3·0 millions for tubes. The capacity required to meet the demand at the end of the Third Plan will be 3·7 million numbers of tyres and tubes. Thus an additional capacity to the tune of 0·76 million numbers of tyres and 0·7 million numbers of tubes is required to be created. This capacity should be achieved mainly by the substantial expansion of the existing units.

The total capital investment required for a capacity of 1·9 million numbers, envisaged to come in production during the period of the Third Plan is estimated at about Rs. 10·0 crores. It is estimated that an investment of Rs. 2·5 crores had taken place during Second Plan period on schemes which have been cleared for the import licence. Thus an investment of Rs. 7·5 crores will be required during the period of the Third Plan. The value of machinery requirements would be about Rs. 5·0 crores. Out of this the imported component would be about Rs. 3·5 crores.

Bicycle Tyres and Tubes :

Estimated requirements.—Bicycle tyres and tubes are required (a) as original equipment for new cycles and (b) for replacement purposes.

The production of bicycles is estimated to be 1·05 million numbers by 1960-61 and the demand for bicycle tyres and tubes as original equipment is placed at about 2·10 million numbers. It is estimated that the total number of bicycles on the road were about 7·5 millions in 1960-61. Assuming annual replacement requirements at 1·3 tyres and tubes per bicycle, the replacement demand comes to about 10·0 million numbers. Thus the internal demand for bicycle tyres and tubes is estimated to be 12·1 million numbers. The exports for 1960-61 are expected to be 0·2 million numbers.

The programme for the bicycle industry envisages production of the order of 2·5 millions by 1965-66. Correspondingly, the requirements of bicycle tyres and tubes as original equipment will be 5·0 million numbers. It is estimated that the number of bicycles on the road by 1965-66 will be 18·0 million numbers. Taking the same rate of replacement per bicycle, the replacement requirements will come to 23·4 million numbers. Adding to this an export requirements of 2·5 million numbers, the total demand for bicycle tyres and tubes will be of the order of 30·9 million numbers by 1965-66.

On the basis of 80 per cent production efficiency, the capacity target should be 38·6 million numbers of tyres and tubes each by 1965-66.

Additional Capacity Required.—The capacity at the end of the Second Plan of bicycle tyres and tubes was 15·115 and 16·689 million numbers respectively. Further a capacity of 13·312 million numbers has been licensed for bicycle tyres and 12·68 million numbers for bicycle tubes. Out of this, a capacity of 4·230 million numbers for bicycle tyres and 4·275 million numbers for bicycle tubes has been cleared for import licence. In view of this, additional capacity to be created for meeting the requirements in 1965-66 will be about 12·16 and 9·23 million numbers for tyres and tubes respectively.

Investment.—Of the 12·160 million numbers of capacity to be created for bicycle tyres and 9·230 million of bicycle tubes; 7·16 million numbers for tyres and 4·23 million numbers for tubes could be achieved by substantial expansion of the existing units. The balance of capacity of 5·0 million numbers of bicycle tyres and tubes should be secured through 3 new units each with a capacity of about 2 million numbers of tyres and tubes.

The total capital investment required for capacity of 23·0 million numbers of tyres and tubes envisaged to come in production during the period of the Third Plan is estimated to be Rs. 5·0 crores. It is estimated that an investment of Rs. 1·0 crore had taken place during Second Plan period on schemes cleared for import licence. Thus an investment of the order of Rs. 4·0 crores will be required for the Third Plan period. Its imported component will be about Rs. 1·5 crores.

Requirements of Raw rubber and other raw materials.—Raw rubber is the main raw material of this industry. At the time of the formulation of the Second Five Year Plan, it was estimated that the demand for raw rubber for all uses might increase to over 40,000 tons by 1960-61. The actual consumption in this year has been now estimated at 58,000 tons.

The annual production of natural rubber in India since 1955 has been as follows :

	Tappable acreage under rubber	Annual production (tons)
1955	180,000	22,481
1956	178,500	23 444
1957	175,500	23,767
1958	173,600	24,328
1959	177,755	23,398
1960	N. A.	24,690

The fall in production of rubber in 1959 in spite of an increase in the tappable acreage was due to heavy rains resulting in the loss of several tapping days.

Imports of rubber during the period of the Second Plan were as follows :

	Natural rubber		Synthetic rubber		Reclaimed rubber	
	Quantity (tons)	Value (Rs. lakhs)	Quantity (tons)	value (Rs. lakhs)	Quantity (tons)	Value (Rs. lakhs)
1957 . . .	9,860	313·1	3,000	88.8	1,550	17·8
1958 . . .	11,950	311·4	3,338	95·6	1,417	14·93
1959 . . .	15,307	514·9	4,619	133·2	2,318	23·36
1960 . . .	22,683	817·5	8,661	246·0	3,054	36·7

These figures show that there was a gap of about 34,403 tons between demand and the production of raw rubber within the country in 1960. This gap will be further widened as a result of the estimated growth of demand.

It is estimated by the Working Group on Rubber Plantation Industry that the demand for rubber will increase to 110,000 tons by the end of the Third Plan, while the production of natural rubber would be 45,000 tons. The availability of natural, synthetic rubber and reclaimed rubber in each year of the Third Plan is estimated to be as follows :

		Natural rubber (tons)	Synthetic rubber (tons)	Reclaimed rubber (tons)	Total of all varieties of rubber (tons)
1961-62 . .	Indigenous . .	26,000	..	1,000	
	Imported . .	22,000	10,000	6,000	
	TOTAL .	48,000	10,000	7,000	65,000
1962-63 . .	Indigenous . .	30,000	..	4,000	
	Imported . .	24,000	10,000	4,000	
	TOTAL .	54,000	10,000	8,000	72,000
1963-64 . .	Indigenous . .	35,000	10,000	8,000	
	Imported . .	20,000	8,000	1,000	
	TOTAL .	55,000	18,000	9,000	82,000
1964-65 . .	Indigenous . .	40,000	30,000	12,000	
	Imported . .	13,000	..	..	
	TOTAL .	53,000	30,000	12,000	95,000
1965-66 . .	Indigenous . .	45,000	50,000	15,000	
	Imported . .	..	..	..	
	TOTAL .	45,000	50,000	15,000	110,000

As regards natural rubber, there is no shortcut for achieving self-sufficiency during the Third Plan period by an increase in its production because the rubber tree in India normally takes 7 to 8 years from planting to come into bearing. However, if an all-out effort is made by the employer and the employee on estates, the production of existing rubber trees can be increased by 10 to 15 per cent over the above estimates.

A programme has been proposed for replanting with high yielding seedlings at the rate of 7,000 acres and this would be completed by 1966. In order to intensify this programme, it has been decided to raise the amount of subsidy from Rs. 240/400 to Rs. 1,000 per acre for replanting. Loan assistance to the tune of Rs. 750 per acre is also to be given for new plantation during the period of the Third Plan. It is expected that the production of natural rubber will be 45,000 tons by 1965-66. But the annual demand for rubber is estimated to be 110,000 tons. Thus indigenous production of natural rubber will not catch up with internal consumption. There will be wide gap to be filled by recourse to synthetic rubber and reclaimed rubber for many years to come.

The current usage proportions of natural rubber, synthetic rubber and reclaimed rubber in some of the industrially advanced countries are as follows :—

Country	Quantity in tons and per cent			Total
	Natural rubber	Synthetic rubber	Reclaimed rubber	
U.S.A. (1958)	485,242 30%	872,162 55%	246,656 15%	1,604,060
U.K. (1958)	175,460 65%	62,979 23%	33,567 12%	272,006
France (1957)	135,185 64%	49,925 24%	26,127 12%	2,11,237
Germany (1957)	136,000 63%	47,000 22%	34,099 15%	2,17,099

The above table shows that natural rubber and synthetic rubber can be used in blends of varying proportions of the two. The consumption pattern of synthetic rubber in the U.K. and the U.S.A. may not fully hold good for India since in India the demand for truck tyres is the dominant feature whereas in the Western countries more of car tyres are required. As far as our requirements in the country are concerned the proportion can be adjusted in such a way as to fully utilise the domestic synthetic rubber to the maximum extent.

The use of synthetic and reclaimed rubber which have become competitive with natural rubber has come to stay in many countries and India could use them in increasing quantities in line with the world trend particularly in view of the tardy growth of output of natural rubber in the country.

As early as December, 1954, suggestions were made for the establishment of a synthetic rubber plant to meet this widening gap between production and consumption of raw rubber. Alcohol which was available in large tonnages was suggested as the starting material. The pioneering work for setting up a synthetic rubber plant was carried out by the Development Wing and the N.I.D.C. up to 1958. In 1959 a licence was issued to M/s. Kilachand Devichand & Co. Ltd., Bombay, for the establishment of a new unit of 20,000 tons at Bareilly (U.P.) for the manufacture of general purpose synthetic rubber. This capacity is to be raised to 30,000 tons later on. M/s. Firestone Tyres and Rubber Co., Akron Ohio, U.S.A. are providing technical and financial collaboration for this scheme. The scheme is expected to come into production by 1963 and thereafter, the supplies of synthetic rubber from indigenous source will improve considerably. In 1961, another project for the manufacture of cis-4-poly butadine rubber based on the natural gas supplies in Assam was approved. It is proposed to be located in the Naharkatiya area and will have an annual capacity of 20,000 tons. This plant is expected to be in production by 1965.

The current demand of reclaimed rubber is placed at 6,000 to 7,000 tons though present imports are confined to about 3,000 tons. The position of reclaimed rubber will also improve considerably with the completion of four schemes licensed recently for a capacity of 8,500 tons.

Carbon black is another essential raw material for the industry. The current consumption of carbon black is stated to be about 8,000 tons of furnace black, 3,500 tons of channel black and about 5,000 tons of other grades of carbon black. The entire quantity of carbon black is imported into the country at present.

A scheme of M/s. Duncan Bros. & Co. Ltd., Calcutta, has been licensed in 1959 for carbon black manufacture. The unit for carbon black under this scheme will be established at Durgapur with a yearly capacity of 30·0 million lbs. in technical collaboration of M/s. Phillips Petroleum Co. of U.S.A. Recently one more scheme of 10,000 tons of furnace type carbon black to be established in Assam in collaboration with M/s. Continental Carbon Company have been cleared by the Licensing Committee. With the coming in production of these schemes there would be near self-sufficiency in respect of furnace black, which constitutes the bulk of carbon black consumed in this country.

Another raw material required in large quantities by rubber tyre industry is tyre cord. At present rayon and nylon tyre cord are entirely imported. The position relating to future supplies of this item has been dealt under the rayon industry.

The imports of accelerators and antioxidants will be reduced considerably during the Third Plan period with the completion of the scheme of M/s. Alkali & Chemical Corporation of India for the manufacture of 2,000 tons of accelerators and antioxidants at Rishra in West Bengal.

Additional Employment in the Industry.—It is estimated that with the installation of additional capacity recommended for all the rubber manufactures during the Third Five Year Plan, additional employment of the order of 50,000 is likely to be generated.

Tyres and tubes for animal drawn vehicles.—Though the demand potential for tyres and tubes for animal drawn vehicles is quite considerable, the actual off-take has so far been very small. There is no prospect of large scale conversion of bullock carts with iron tyres into pneumatic cladding, though this development is highly desirable. This demand has not been taken into account in the estimates of the requirements of tyres and tubes during Third Plan period.

Other Rubber Manufactures.—Apart from pneumatic tyres and tubes, a variety of other useful products are manufactured by the rubber manufactures. In most of the products the installed capacity of the industry has substantially increased during the period of the Second Plan. The industry has been able to ensure self sufficiency with regard to diverse rubber goods needed in the home market, except in the case of certain specialised items which are being imported in very small quantities.

The present position in regard to some of the major items of rubber manufactures is summarised at Annexure III. This statement indicates the annual capacity at the end of 1960 and production in recent years of the more important rubber products.

The manufacture of rubber footwear is the most important single item providing the largest employment and accounting for a substantial consumption of rubber. Given adequate supplies of polyvinyl chloride a partial switchover from rubber can be envisaged in this field if supplies of rubber are inadequate.

Schemes licensed and under implementation.—A good number of schemes for the manufacture of tyres regarding materials, conveyor belting, synthetic rubber cots and aprons and other rubberised fabrics have been licensed. A list of these schemes is given in Annexure IV.

The programme of development for the rubber tyres and tubes industry envisaged for the Third Plan period is summarised below :

	1960-61	1965-66
Annual Capacity (million numbers)		
Automobile tyres	1·608	3·7
Automobile tubes	1·661	3·7
Bicycle tyres	15·115	38·6
Bicycle tubes	16·689	38·6
Production (million numbers)		
Automobile tyres	1·491	3·0
Automobile tubes	1·411	3·0
Bicycle tyres	11·15	30·9
Bicycle tubes	13·26	30·9
Exports (thousand numbers)		
Automobile tyres	6·1	150
Automobile tubes	4·1	150
Bicycle tyres	492·0	2,500
Bicycle tubes	6·6	2,500

ANNEXURE I

Schemes under Implementation for Automobile Tyres and Tubes

Name of the unit	Location	Tyres (nos.)	Tubes (nos.)
A. Schemes cleared for import licence			
M/s. Premier Tyres	Kottayam (Kerala)	240,000	240,000
M/s. General Tyres Ltd. (National Rubber).	Calcutta	180,000	180,000
M/s. Goodyear Tyres of India	Ballabhgarh (Punjab)	210,000	182,000
	TOTAL	630,000	602,000
B. Schemes yet to be cleared for import licence			
M/s. Ceat Tyres (Second & third stage)	Bombay	300,000	300,000
M/s. Madras Rubber Co. of India.	Madras	300,000	300,000
M/s. Dunlop Rubber Co. of India	Sahaganj (W. Bengal)	49,200	135,600
M/s. Dunlop Rubber Co. of India	Ambattur (Madras)	54,000	..
	TOTAL	703,200	735,600
	GRAND TOTAL OF A AND B	1,333,200	1,337,600

ANNEXURE II

Schemes under Implementation for Bicycle Tyres and Tubes

Name of the unit	Location	Tyres (nos.)	Tubes (nos.)
A. Schemes cleared for the import licence			
1. M/s. Travancore Rubber Works	Trivandrum (Kerala)	1,530,000	1,125,000
2. M/s. Cosmos India Rubber Works (P) Ltd.	Bombay	900,000	900,000
3. M/s. Oriental Rubber Industries, Bombay	Bombay	1,800,000	1,800,000
4. M/s. Ruby Rubber Works	Madras	..	450,000
	TOTAL	4,230,000	4,275,000
B. Schemes yet to be cleared for import licence			
1. M/s. R. B. S. Rubber Mills (P) Ltd.	Lilloha, Howrah	702,432	..
2. M/s. Goray & Co. (National Rubber Works	Bombay	900,000	900,000
3. M/s. Bengal Waterproof Works Ltd.	Calcutta	1,800,000	1,800,000
4. M/s. Imperial Tyres & Rubber Co. Ltd.	Vikroli, Bombay	900,000	900,000
5. M/s. Dunlop Rubber Co. of India	Ambattur (Madras)	996,000	..
6. M/s. Modi Sugar Mills	Modinagar (U.P.)	1,800,000	3,600,000
7. M/s. Indian Rubber Mfg. Co.		..	1,320,000
	TOTAL	7,098,432	8,400,000
	GRAND TOTAL OF A AND B	11,328,432	12,675,000

ANNEXURE III

Item	Unit	Capacity	No. of units	Production 1956	1957	1958	1959	1960
Ebonite rod and sheets	Kgms.	583,640	14	94,339	107,839	105,448	114,838	132,456
Water-proof fabrics	Metres	619,145	12	2,340,495	2,797,412	2,914,770	3,300,120	3,693,851
Latex Foam sponge	Kgms.	547	7	799,695	880,091	1,001,720	1,087,000	1,261,000
Dipped Rubber goods	'000 Doz.	44,427	13	25,994	19,847	24,230	28,916	32,423
Radiator hoses	Nos.	546,300	9	248,792	171,313	168,196	214,851	248,594
Vacuum brake hoses	Nos.	1,080,000	4	551,607	777,224	602,151	470,085	345,532
Other types of hoses	Metres	3,460	14	2,001,039	2,412,630	2,732,453	3,433.000	3,480,000
Fan belts	Nos.	1,298,800	7	725,079	652,730	666,464	1,040,252	1,087,203
Vee belts	Nos.	..	5	266,946	450,844	546,071	729,889	952,414
Rubber components of Railway fittings (springs)	'000 Nos.	1,536	4	1,655	1,763	1,350	1,260	638

ANNEXURE IV

Schemes Licensed and under Implementation

Name of the Unit	Name of the product	Capacity
M/s. Feuner Co. Ltd., Madurai	Synthntic rubber cots	72,960 rft. per annum
	Cloth reinforced Synthetic rubber cots.	1,200 rft. per annum
	Synthetic rubber cover rollers.	1,200 rft. per annum
	Synthetic rubber aprons .	6,000 rft. per annum
	Synthetic rubber tap twirter sleeves.	6,960 rft. per annum
	Synthetic rubber moulded jute spinning aprons.	1,920 rft. per annum
M/s. Swastik Rubber Products Ltd., Kirkee, Poona.	Cane Sealing Compound .	120,000 lbs.
M/s. Imperial Tyres & Rubber Co. (P) Ltd., Vikroli, Bombay.	Delivery Petrol Welding spray and air hose.	5·4 lakhs ft. per annum.
	Belting Rubber . .	3·6 lakhs ft. per annum.
	Rubberised material .	1·8 lakhs ft. per annum.
M/s. Madras Rubber Factory Madras.	Tyre repair and retreading Material.	4,200,000 lbs per annum.
M/s. Indian Rubber Manufacture, Howrah.	Synthetic rubber cots .	180,000 rft. per annum
	Synthetic rubber aprons .	120,000 rft. per annum.
M/s. Ruby Rubber Works, Bangalore.	Tyre retreading material .	780,000 lbs. per annum.
M/s. Premier Belting Ltd., Kottayam.	Rubber conveyor belts .	540 tons per annum
M/s. East India Rubber Conveyor Belting Works (P) Ltd.	Conveyor belting . .	90,000 rft. per annum

54. TANNING AND FOOTWEAR

A. TANNING

I. Review of Progress in the Second Plan:

Targets.—The demand for tanned hides and skins in 1960-61 was estimated at 23 million hides and 26 million skins. These were adopted as the targets of production for the Second Five Year Plan. However, the development of this industry was recognised as being generally limited by the shortage of raw hides in the country.

Capacity and production.—At the commencement of the Second Plan, there were 24 organised tanneries manufacturing vegetable tanned buffalo and cow leather, of which 13 produced chrome tanned upper leather also. Their annual capacity in terms of cow hides (1 buffalo hide=2 cow hides) was 3·304 million hides for vegetable tanning and 1·679 million hides for chrome tanning. During the Second Plan period some existing units came within the purview of the Industries (Development & Regulation) Act and were registered. M/s. Bhopal Glues and Chemicals Ltd., Bhopal were licensed to manufacture a new article namely, vegetable tanned leather with a capacity of 300,000 lbs. per annum. One of the units discontinued the manufacture of chrome leather and thus went off the active list of the Development Wing of the Ministry of Commerce and Industry.

At the end of the Second Plan period, there were 32 organised tanneries with an annual capacity of 4·422 million hides for vegetable tanning; 12 of them also produced chome leather with a capacity of 1·549 million hides. The State-wise distribution of this capacity is given below:

State	Vegetable tanning		Chrome tanning	
	Number of units	Annual capacity ('000 numbers)	Number of units	Annual capacity ('000 numbers)
Uttar Pradesh	14	2,792	4	857
Madras	5	390	3	165
Maharashtra	3	249	1	120
West Bengal	2	306	2	339
Gujarat	2	53	..	..
Mysore	1	42	1	60
Orissa	1	27	1	8
Bihar	1	317	..	..
Punjab	1	96	..	..
Andhra Pradesh	1	120	..	..
Madhya Pradesh	1	30	..	..
TOTAL	32	4,422	12	1,549

Actual production has been considerably below the installed capacity mainly due to the shortage of raw hides. The production figures for the last 6 years are tabulated below :

	Vegetable tanning ('000 numbers)	Chrome tanning ('000 numbers)
1955	1,636	677
1956	1,683	742
1957	1,792	630
1958	2,067	678
1959	2,467	651
1960	2,691	794

The manufacture of glace kid, a leather of high quality obtained by the chrome tanning of goat skins, continued to be done by 3 units located in the Madras State. There has been no change in their capacity and the present production is very much below the capacity. The internal demand for this product being very small, any large-scale glace kid manufacturing unit would have to depend on foreign markets for the sale of its production. Although one of the existing units has been successful in exporting limited quantities of glace kid during the past few years, it has not been possible to make much headway. Glace kid leather has to conform to the changing fashions in the overseas markets. It is only a sufficiently large unit which can cater to the changing needs of an external market and/or has ties with purchasers abroad that can successfully operate in the field of glace kid. The setting up of such a unit requires substantial investment. In view of these circumstances, enterpreneurs have been rather hesitant to enter this field. The possibility of an entrepreneur starting a glace kid factory with foreign collaboration is being explored by the Development Wing.

No reliable statistics of production in the unorganised sector are available. The Development Council for Leather and Leather Goods Industries has estimated the total production of tanned hides and skins in the country in 1960-61 at 19·5 million hides and 28·1 million skins. Taking out the production in the organised sector of about 3·5 million hides, the production in the unorganised sector may be placed at about 16 million hides. The bulk of the production of 28·1 million tanned skins is from the unorganised sector.

On the basis of the above estimates, it would be seen that there is a shortfall in the production target for tanned hides whereas the target fixed for tanned skins has been exceeded.

Imports and exports.—Due to their continued shortage in the country, the imports of raw hides and skins went up progressively during the Second Plan period. Import figures for the last four years are given below :

(Rs. lakhs)

1957	117·5
1958	131·4
1959	173·4
1960	255·8

Mostly these consist of hides although some skins are also being imported.

The exports of leather (tanned hides and skins) and raw skins from 1957 onwards have been as follows :

(Value in Rs. lakhs)

	Leather	Raw skins
1957	2,158·3	694·4
1958	1,825·4	717·0
1959	2,857·2	1,070·2
1960	2,563·4	1,013·3

Large quantities of semi-tanned leather are being exported at present. With a view to earning more foreign exchange, efforts are being made to export more of finished leather after retanning the semi-finished product. Also, quota restrictions have been imposed on the export of raw skins so that these could be tanned in the country and then exported.

Raw materials.—The inadequate supply of raw hides has again persisted during the Second Plan period on account of (i) the progressive implementation of anti-cow slaughter legislation enacted by various State Governments and (ii) the increased production of leather belting and other industrial leathers which require imported heavy hides. As already stated, the imports of raw hides have gone up considerably during the Second Plan period.

The supply of wattle bark from indigenous sources continues to be inadequate. During 1960 imports of wattle bark amounted to about Rs. 31 lakhs and those of wattle extract to about Rs. 85 lakhs. During the Third Plan period there are programmes to extend the area under wattle plantations in the States of Madras, Kerala and Assam.

Development Council for the Industry.—A Panel for Leather and Leather Goods Industries was constituted in 1958 to consider the problems of the industry such as the shortage of raw hides in the country, survey of indigenous tanning materials, plantation of wattle, babul and other suitable

tanning bearing species marketing of tanned hides and skins, standardisation of goods meant for export, steps to be taken for ensuring proper functioning of existing units etc. and making recommendations to the Government. In January, 1960 a Development Council was formed in place of the Panel.

II. Programme of Development in the Third Plan :

Estimated requirements and targets.—The principal user of leather in the country is the footwear industry. Other uses are for the manufacture of cycle saddle tops, travel goods and industrial goods like belting, pickers, picking bands etc. A considerable quantity of leather is also exported.

The additional requirements of tanned hides and skins in the country in the final year of the Third Plan have been estimated by the Development Wing at 2·5 million pieces and 1·9 million pieces respectively. Assuming the quantum of annual exports to remain steady at the 1960-61 level during the Third Plan period, the demand in 1965-66 may be estimated at about 22 million hides and 30 million skins.

In view of the fact that the existing capacity of the tanning industry both in the organised and unorganised sectors is not being adequately utilised due to the shortage of raw hides, no expansion of capacity is envisaged during the Third Plan period with the exception of glace kid and finished leathers solely meant for exports. In the decentralised sector attention would be devoted to improvements in the production techniques for upgrading the quality of tanned leather.

Requirements of raw materials.—To achieve a production of 52 million tanned hides and skins (22 million hides and 30 million skins) in 1965-66, the industry will require the following quantities of the principal raw materials :

Raw hides	22 million pieces
Raw skins	30 million pieces
Lime	30,000—35,000 tons
Wattle bark and wattle extract	35,000 tons
Other barks	350,000 tons
Myrabolans	30,000—35,000 tons

In view of the progressive implementation of the anti-cow slaughter legislation enacted by the various State Governments, it is open to question whether the additional requirements of raw hides during the Third Plan period can be met from indigenous sources. Supplies might have to be arranged through imports from neighbouring countries. The potential use of polyvinyl chloride as a substitute for leather is under examination and it might partly relieve the strain on imports of raw hides and rubber. The other raw materials except wattle bark and extract are wholly indigenous.

B. FOOTWEAR

1. Review of Progress in the Second Plan:

Targets.—The domestic requirements of leather footwear were estimated at 100 million pairs in 1960-61. Exports in that year were envisaged at 2 million pairs of Western type footwear. The capacity of these factories for Indian type footwear, which are hand made, fluctuates with demand.

Capacity and production.—At the commencement of the Second Five Year Plan, there were 12 large-scale leather footwear factories with an annual capacity of about 5·975 million pairs of Western type footwear. During the Second Plan period, two units in Uttar Pradesh went off the active list of the Development Wing and one unit in Madhya Pradesh came within the purview of the Industries (Development and Regulation) Act and was, therefore, registered. M/s. Carona Sahu Co. Ltd., Bombay, who were already manufacturing rubber footwear, were licensed a capacity of 300,000 pairs of leather footwear per annum on the condition that they would export 50% of their production. There was also a reassessment of the capacity of the industry. In April, 1961, there were 12 units with an annual capacity of 7·012 million pairs of Western type footwear. The capacity of these factories for Indian type footwear, which are handmade, fluctuates with demand. State-wise distribution of the units is tabulated below:

Western Type Footwear

State	Number of units	Annual capacity ('000 pairs)
Uttar Pradesh	5	2,127
West Bengal	1	4,524
Bihar	1	*
Maharashtra	1	300
Madhya Pradesh	1	36
Madras	1	15
Punjab	1	8·4
Mysore	1	1·2
TOTAL	12	7,011·6

*Although equipped to manufacture Western type footwear, this factory is at present manufacturing Indian type only.

The production of the large-scale factories from 1955 onwards is given below :

	Western type ('000	Indian type pairs)
1955	3,243	2,303
1956	3,620	2,911
1957	4,370	3,038
1958	4,277	3,286
1959	4,139	4,103
1960	5,420	3,780

Reliable production statistics for the small-scale and cottage units, which are responsible for manufacturing over 90% of the total output, are not available and hence a regular study of the production trends is not possible. The Development Council for Leather and Leather Goods Industries has estimated the total production of leather footwear in 1960-61 at 102 million pairs, which is the target laid down in the Plan.

Imports and exports.—There were no significant imports of leather footwear during the Second Plan period. The exports during the last four years have been as follows :

	Quantity (million pairs)	Value (Rs. crores)
1957	2·48	2·26
1958	2·11	1·77
1959	2·61	2·52
1960	2·49	2·67

As is evident from the figures tabulated above, the export target of 2 million pairs envisaged in the Plan has been exceeded.

II. Programme of Development in the Third Plan :

Estimated requirements.—The Development Council for leather and Leather Goods Industries has estimated the requirements of leather footwear in 1965-66 at 140 million pairs, of which 4 to 5 million pairs are expected to be exported. These estimates have been adopted subject to a review some time in 1963.

Targets of capacity and production.—In view of the fact that the leather footwear industry can be organised on a labour intensive basis and a substantial expansion in employment opportunities is one of the principal aims of the Third Plan, no expansion of capacity in the large-scale sector of the industry is envisaged during the five-year period. The additional demand for footwear is expected to be met by a fuller utilisation of the existing capacity in the large-scale sector and by developments in the cottage and small-scale sectors.

Requirements of raw materials.—According to the estimates of the Development Wing, the leather footwear industry will require the following quantities of the principal raw materials for achieving a production of 140 million pairs in 1965-66 :

Leather	14·5 million tanned hides and 6·5 million tanned skins.
Thread	7·5 million reels for uppers and 495 tons for bottom stitching.
Eyelets	390 million pieces.

The table below summarises the development programme for the tanning and footwear industry in the Third Plan :

	Production	
	1960-61	1965-66
Tanned hides and skins (million pieces) . . .	47·6	52·0
Leather footwear (million pairs)	102·0	140·0

55. PAPER AND PAPER BOARD

1. Review of Progress in the Second Plan :

Targets

(i) *Paper and paperboard.*—The Planning Commission estimated that the requirements of paper and paperboard would be 350,000 tons per annum by 1960-61. With a view to achieving self-sufficiency in this commodity a capacity target of 450,000 tons was fixed for 1960-61 which on the basis of 80% utilisation of capacity, would yield production of 350,000 tons.

(ii) *Newsprint.*—Although the demand for newsprint was estimated to increase to 120,000 tons by 1960-61 a production target of 60,000 tons only was envisaged having regard to the practical possibilities in this sector. It was expected that a second newsprint factory of 30,000 tons capacity would be set up during the Second Plan period thus increasing the total capacity to 60,000 tons.

(iii) *Strawboards and other boards.*—The requirements of strawboards and other boards were estimated to increase to about 35,000-40,000 tons by 1960-61. A capacity target of 59,380 tons, which was about equal to the facilities already available, was considered sufficient to meet this demand.

As against the targets indicated above, the actual progress made in different sectors of the industry during the Second Plan period has been as indicated in the following paragraphs.

Capacity, production and consumption

(i) *Paper and paperboard.*—At the beginning of the Second Plan, *viz.*, in April 1956, there were 20 paper factories in the country with an annual installed capacity of about 210,100 tons. Since then nine new units with a total annual capacity of about 57,210 tons have gone into production, but one unit *i.e.*, M/s. Pudukotah Paper Mills, Madras, with an annual capacity of 600 tons ceased production so that the number of units in operation at present is 28. Sixteen of the existing factories have modernised themselves or directly expanded, leading to an increase in capacity of about 142,890 tons. Details of these units and expansions completed during April 1956 to March, 1961 are given below :

Name of the Unit	Nature of Scheme	Annual Capacity as on 1-4-56 (tons)	Annual Capacity as on 1-4-61 (tons)	Increase in Capacity (tons)
1	2	3	4	5
M/s West Coast Paper Mills, Dandeli, North Kanara District (Mysore)	New Unit	..	24,900	24,900
M/s WIMCO Paper Mills, Calcutta (West Bengal).	Do.	..	6,000	6,000
M/s Pudumji Paper Mills, Khapoli, (Maharashtra).	Do.	..	3,300	3,300

1	2	3	4	5
M/s Titaghur Paper Mills, Choudwar (Orissa)	New Unit	..	12,000	12,000
M/s Bharat Carbonate & Ribbon Co., Faridabad (Punjab).	Do.	..	1,200	1,200
M/s Delhi Pulp Industries, Faridabad (Punjab).	Do.	..	3,000	3,000
M/s Providence Paper Mills, Bombay (Maharashtra).	Do.	..	510	510
M/s Kondivita Paper & Board Mills, Bombay (Maharashtra).	Do.	..	900	900
M/s Straw Products Ltd., Bhopal (Madhya Pradesh).	Do.	..	5,400	5,400
M/s Titaghur Paper Mills, Titaghur (West Bengal).	Expansion	42,000	50,000	8,000
M/s India Paper Pulp Co. Ltd., Naihati (West Bengal).	Do.	6,600	15,000	8,400
M/s Orient Paper Mills Ltd., Brajrajnagar (Orissa).	Do.	36,000	60,000	24,000
M/s Rohtas Industries Ltd., Dalmianagar (Bihar).	Do.	29,000	60,000	31,000
M/s Gujarat Paper Mills, Ahmedabad (Gujarat)	Do.	2,500	6,000	3,500
M/s Sirpur Paper Mills, Kaghaznagar (Andhra Pradesh).	Do.	15,000	36,000	21,000
M/s Ballarpur Paper & Strawboard Mills Ltd., Ballarpur (Maharashtra).	Do.	8,000	12,600	4,600
M/s Shri Gopal Paper Mills, Yamunanagar (Punjab)	Do.	15,000	26,700	11,700
M/s Bengal Paper Mills, Raniganj (West Bengal).	Do.	14,000	19,800	5,800
M/s Star Paper Mills Ltd., Saharanpur (U.P.)	Do.	6,500	22,200	15,700
M/s Paper and Pulp Conversion Ltd., Poona (Maharashtra).	Do.	4,600	7,500	2,900
M/s Upper India Couper Mills Co. Ltd., Lucknow (U.P.).	Modernisation.	3,000	4,200	1,200
M/s Punalar Paper Mills Ltd., Punalar (Kerala).	Do.	6,000	8,640	2,640
M/s Andhra Paper Mills Co. Ltd., Rajmundhary (Andhra Pradesh).	Do.	2,000	3,000	1,000
M/s Pudumji Paper Mills Ltd., Bombay (Maharashtra).	Do.	1,200	1,500	300
M/s Tribeni Tissues Ltd., Chandrahati (West Bengal).	Do.	3,500	4,650	1,150
TOTAL .				200,100

The net increase in capacity is 199,500 tons after deducting the capacity of the Pudukotah factory.

As a result of the implementation of the above schemes the annual capacity of the paper and paperboard industry stood at 410,000 tons on 1st April, 1961 as against the capacity target of 450,000 tons envisaged for 1960-61.

The State-wise distribution of the industry as on 1-4-56 and on 1-4-61 is as follows :

State	Position as on 1-4-56		Position as on 1-4-61	
	No. of Units.	Annual installed capacity (tons)	No. of units	Annual installed capacity (tons)
West Bengal	4	66,100	5	95,450
U.P.	2	9,500	2	26,400
Bihar	1	29,000	1	60,000
Orissa	1	36,000	2	72,000
Punjab	1	15,000	3	30,900
Gujrat	1	2,500	1	6,000
Maharashtra	4	17,400	7	29,910
Andhra Pradesh	2	17,000	2	39,000
Mysore	2	11,000	3	36,300
Kerala	1	6,000	1	8,640
Madras	1	600	..	..
Madhya Pradesh	..	..	1	5,400
TOTAL	20	210,100	28	410,000

The production of different varieties of paper and paperboard in the year 1955-56 and during the Second Plan period is given below:

(tons)

Variety	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61
Printing & writing paper	119,689	124,174	133,554	157,354	190,022	214,944
Wrapping paper	29,519	31,958	37,904	43,888	59,391	61,318
Special varieties	5,676	5,958	6,937	5,981	6,182	8,971
Paperboard	31,965	35,099	40,586	53,833	56,505	57,972
TOTAL	186,849	197,189	218,981	261,056	312,100	343,205

Although the capacity target was not fully reached, the production in 1960-61 was only slightly below the target of 350,000 tons as a result of better utilization of capacity than the 80% assumed.

During the Second Plan, besides important items of production like brush coated art paper, press-pahn paper, vulcanized fibre, vulcanised fibre rods and tubes, seamless cards and silver cans, the manufacture of specialised paper such as high gloss poster paper, bank paper, bond paper, crome paper, cartridge paper, cheque paper, calculating machine paper and teleprinter paper, litho and offset paper was taken up in the country.

The consumption of paper and paperboard (excluding newsprint and old newspaper) on the basis of domestic production plus imports (exports

have been insignificant) during the First Plan, and the Second Plan is shown in the table below :

('000 tons)

	Production	Imports	Quantity available for consumption	As estimated in the Plan
1951-52	135·0	33·0	168·0	175·0
1952-53	137·0	39·0	176·0	175·0
1953-54	137·0	42·0	179·0	
1954-55	169·0	38·0	207·0	
1955-56	187·0	50·0	237·0	200·0
1956-57	197.0	45.0	242.0	
1957-58	219·0	41·5	260·5	
1958-59	261·0	15·0	276·0	
1959-60	312·0	18·0	330·0	
1960-61	343·0	23·0	366·0	350·0

Imports figures from 1957 onwards are in calendar years.

It will be observed that the rate of growth of the demand for paper and paper board during the First Plan period was about 8% per year. In the Second Plan Period the demand was expected to show a progressive annual increase of 10%. The actual increase in consumption, as distinct from demand, has averaged about 9·7% per annum in the first four years of the Second Plan. This somewhat lower consumption as compared with the demand estimates is explained by the fact that owing to the restrictions imposed on the import of paper and paperboard from 1957 onward the supplies of paper and paperboard were not sufficient to meet the full demand in the country. During this period there has been scarcity of paper and availability has admittedly been short of demand. It will be seen, however, that in the last year of the Plan the consumption of paper and paperboard exceeded the estimated figure of 350,000 tons envisaged in the Plan. In other words over the Plan period as a whole an increase equivalent to about 10·9% per annum had been maintained. However, though the position in regard to availability of paper and paperboard has somewhat eased, there is still some shortage of paper on account of import restrictions. If paper and paperboard were available more freely, the consumption of paper and paperboard would in all probability have been higher than originally estimated. The Panel on paper and paperboard has placed the effective demand for paper and paperboard in 1960-61 at 400,000 tons.

(ii) *Newsprint.*—There is at present only one unit in the country manufacturing newsprint *viz.*, Nepa Paper Mills with an annual capacity of 30,000 tons. It had been envisaged that the capacity would go up to 60,000 tons by 1960-61 through the establishment of a second newsprint factory projected under the programme of the National Industrial Development Corporation. This unit based on bagasse was proposed to be set up at Sakkharnagar in Andhra Pradesh. Although considerable preliminary studies of the project were conducted over a number of years, little progress could be made with the scheme. In view of the interest envinced by the private sector in the newsprint field it is now considered unnecessary for the N.I.D.C. to proceed with this scheme during the Third Plan period.

The consumption of newsprint on the basis of production plus imports during the First Plan and Second Plan has been as under :

('000 tons)

	Production	Imports	Consumption	As estimated in the Plan
1951—52	..	50·0	50·0	75·0
1952—53	..	54·0	54·0	80·0
1953—54	..	70·0	70·0	
1954—55	..	79·0	79·0	
1955—56	3·6	74·7	78·3	100·0
1956—57	13·6	62·8	76·4	
1957—58	14·2	63·7	77·9	
1958—59	21·9	57·5	79·4	
1959—60	22·4	74·5	96·9	
1960—61	22·9	75·5	98·4	120·0

Import figures from 1957 onwards are in calendar years.

The demand for newsprint was of the order of 80,000 tons in 1955-56. At that time apart from the publication of newspapers and periodicals, newsprint was utilised for printing cheap and religious books, almanacs, hand bills etc. From the middle of 1955 restrictions were imposed confining the utilization of newsprint to newspaper publications and periodicals only. Inspite of these restrictions the consumption of newsprint is estimated to have reached about 98,000 tons in 1960-61 as against 120,000 tons envisaged in the Plan.

(iii) *Strawboard and other boards.*—At the beginning of the Second Plan (April, 1956) there were 24 units on the list of the Development Wing of the Ministry of Commerce and Industry engaged in the production of strawboards with a total annual capacity of 59,380 tons. Since then the number of units has increased to 26. The total annual capacity of these units is at present assessed at 77,424 tons by the Development Wing.

Production of strawboards in the last few years has been as given below :

	Production (tons)
1955	34,544
1956	40,828
1957	44,488
1958	45,450
1959	51,032
1960	54,500

The demand for strawboard and other boards ranged between 25,000 to 35,000 tons during the First Plan period. With the advent of superior packing materials and substitutes, the demand was not expected to increase much during the Second Plan period. The consumption by 1960-61 was roughly estimated at 35,000 to 40,000 tons. The demand for straw boards and other boards rose, however, markedly in 1956, mainly owing to the

increased requirements of the textile industry for packing exports. To meet the rising demand, additional capacity had to be licensed during the Second Plan period. The supply position has since improved. The offtake of strawboards has increased to about 55,000 tons.

Capital investment and foreign Exchange.—About Rs. 44 crores are estimated to have been invested in the paper and paperboard industry during the Second Plan period. The foreign exchange component of this investment is placed at about Rs. 25 crores.

Paper prices.—With the introduction of a restrictive import policy, Government received complaints about the unduly high prices charged by wholesale merchants and retail dealers of paper. In order to safeguard the interest of the consumers, the Government of India, after discussion with the paper manufacturers, decided to refer the question of fair prices for paper to the Tariff Commission. The Tariff Commission was accordingly requested on 1st September, 1958 to enquire into the fair ex-work prices and fair selling prices for different varieties of paper manufactured indigenously and to recommend the fair prices which should be charged by the wholesalers and retailers. The main recommendations of the Tariff Commission, which submitted its report in June 1959, have been accepted by Government and a revised price list came into force with effect from 1st January, 1960.

Major developments in industry.—A Panel for paper and pulp industries was set up in 1957 with a view to drawing up programmes for the development of the paper and pulp industries on rational lines during the Second Five Year Plan period. The main functions of the Panel were to assess the requirements of different varieties of paper, to examine the availability of raw materials and to suggest regional distribution of the capacity for paper manufacture to be created under the Second Plan.

To facilitate the work of the Panel, a number of sub-committees were formed to deal with particular aspects of the industry *e.g.* raw material requirements, assessment of demand for different types of paper, manufacture of machinery, collection and exchange of technical data etc.

The Panel met only six times and was reconstituted in December 1959 as a Development Council. Unlike the Panel whose terms of reference were rather limited, the Development Council has wider functions and has to deal with diverse problems connected with supply of raw materials, production, distribution, quality, efficiency, training, research, labour etc.

Another development which deserves mention is the licensing of small units mostly for the manufacture of cheap type of writing and printing paper for which there is considerable demand in the country. These units have been licensed with a view to dispersing the industry and enabling fuller use to be made of local raw materials such as rags, waste papers, agricultural residues. The establishment of such units is expected to result in wider distribution of sources of supply of paper and reduction in transport charges.

Problems and experience of the industry.—The industry has been experiencing considerable difficulty in arranging for import of plant and machinery from abroad in accordance with the terms of payment stipulated by Government from time to time. Consequently there has been delay in the implementation of schemes.

With the rapid growth of the industry the supply of conventional raw materials has become difficult and has been continuously engaging the attention of the Government. In 1956 an Ad-hoc Committee was set up to survey the available supplies of cellulosic raw materials for the paper industry. The work of the Ad-hoc committee was taken over by the sub-committee on Raw Materials of the Panel for Paper and Pulp Industries.

The sub-committee has examined in some detail the problems connected with the supply of cellulosic raw materials to the paper industry. It has made a number of suggestions and has *inter alia* recommended that State Government should make available fallow lands to paper mills on long term leases to enable them to take up plantation of cellulosic raw materials. It has also recommended that as the future expansion of the paper industry has to be based on cellulosic raw materials like bagasse and fast growing species of timber, the State Governments should take up a planned programme of plantation of eucalyptus wattle and other suitable species. The Madras Government have already given a lead by undertaking an extensive programme of plantation of blue-gum and wattle.

With the formation of the Development Council the work of the Raw materials Sub-Committee has now been remitted to the Development Council which is expected to devote continuing attention to this vital question affecting the future growth of the industry.

II. Programme of Development in the Third Five Year Plan:

Estimated requirements, capacity and production

(i) *Paper and paperboard.*—As already mentioned the panel on Paper and Pulp Industries has placed the demand for paper and paperboard at 400,000 tons in 1960-61. On the basis of a progressive increase of 12½% per annum the growth of demand during the Third Plan period would be as follows:

	(tons)
1961—62	450,000
1962—63	506,000
1963—64	570,000
1964—65	640,000
1965—66	720,000 or 700,000

In the case of a commodity like paper it is rather difficult to make an accurate forecast of the future growth of demand. However, in view of the programme for enhancing educational facilities at all levels and the rapid increase in industrialisation it is safe to assume that the demand for paper and paperboard will increase at a rate higher than in the Second Plan. On the basis of the past trend, a 12½% progressive annual increase in demand in the Third Plan appears to be reasonable assumption to make in estimating the requirements of paper and paperboard in 1965-66. Proceeding on this assumption, the estimated demand at the end of the Third Plan period is placed at 700,000 tons per annum.

Pattern of consumption.—On the basis of an overall demand of 700,000 tons in 1965-66, the Panel for Paper and Pulp Industries has estimated that the demand for different categories of paper by the end of the Third Plan would be as follows:

	(tons)	percentage of total consumption
Writing and printing paper	455,000	65%
Packing and Wrapping paper	112,000	16%
Paperboards	112,000	16%
Miscellaneous and specialities	21,000	3%
TOTAL	700,000	

In the case of an item like paper the aim of planning should be to reach and maintain a position of self-sufficiency. Therefore during the Third Plan period sufficient capacity should be created to achieve production corresponding to the estimated level of demand by 1965-66. The trend of production in recent years seems to show that paper factories have been operating at an average level of about 95% of the capacity. It is improbable that this level could be maintained for any long period. The maximum utilisation of capacity is, however, very desirable and it is considered that even allowing for unavoidable shutdowns, the industry should be able to operate at an average level of at least 85% of its capacity. Thus for achieving a production of 700,000 tons which are the estimated requirements in the last year of the Third Plan the capacity target should be 820,000 tons.

(ii) *Newsprint.*—The demand for newsprint during the First Plan grew at an average rate of about 7·5% per annum. As there were no difficulties about the supply of newsprint, consumption also increased at the same rate. If newsprint had been available freely during the Second Plan period, it is estimated that consumption would have increased at least at the same rate, if not faster.

With a rising standard of living and the spread of literacy, the demand for newsprint is expected to increase at a progressive rate of about 10% per annum during the Third Plan period. On this basis, it is roughly estimated that the demand for newsprint will be of the order of 150,000 tons by 1965-66.

This estimate is endorsed by the Panel for paper and pulp industries, which has reckoned that the demand trend for each year of the Third Plan period will be as given below:

	(tons)
1961—62	100,000
1962—63	110,000
1963—64	120,000
1964—65	135,000
1965—66	150,000

The Third Plan should aim at meeting supplies to the maximum extent possible from within the country so as to keep down imports and the consequent drain on foreign exchange. The main difficulty in expanding the capacity for newsprint in a big way has been the lack of adequate quantities

of raw materials within economic reach to sustain plants of minimum economic size. To some extent the position has now improved due to technological developments which permit the use of bagasse as the chief raw materials. A few schemes based partially on bagasse and Himalayan timber have recently been licensed or recommended for licence (*vide infra*). The implementation of these schemes would raise capacity to about 150,000 tons, and this is the capacity target provisionally set for the Third Plan. As all these schemes are in the preliminary stages and might not reach full production by the end of the Third Plan period, the production target for 1965-66 is tentatively placed at 120,000 tons.

(iii) *Strawboard and other boards.*—The demand for strawboard and other boards is rather limited and there is not likely to be any appreciable increase in demand in the near future. The Panel for Paper and Pulp Industries has estimated that the demand will rise from its present level of 55,000 tons to 70,000 tons by 1965-66. On this basis a production target of 70,000 tons is envisaged for 1965-66. It will be possible to achieve production to this extent with a capacity of 90,000 to 100,000 tons. However, since this industry is capable of being developed on a regional basis, capacity above 100,000 tons can be considered in special circumstances, if the availability of local raw materials offers scope for starting new units or expanding existing ones to meet regional demands.

Against the background of the targets suggested above, the present position in the licensing of additional capacity is indicated in the following paragraphs.

Schemes licensed and under implementation

(i) *Paper and paperboard.*—With a view to increasing the capacity of the industry during the Third Plan, 18 new units and 18 expansion schemes with a total capacity of the order of 499,260 tons per annum have already been licensed or recommended for licence. Details of all these schemes are given in Annexure I at the end. In addition licences have also been given or recommended to 3 small paper mills for expansion and to 83 new small units with capacities ranging mostly from 3 to 10 tons per day. The capacity of these adds upto about 236,000 tons per annum. If all the above schemes were implemented, the capacity of the industry would increase to about 1,145,000 tons. Out of the capacity licensed, the Capital Goods Committee has so far given clearance for import of Capital Goods so as to bring the capacity upto 791,160 tons.

In addition, it is expected that the Security Paper Mill under the Ministry of Finance proposed to be established in the Second Plan period will be set up at Hoshangabad during the Third Plan period. The mill will produce 1,500 tons of bank note and other security paper which is at present entirely imported.

Mention may also be made of the two schemes for the manufacture of paper grade pulp, details of which are given below :

1. M/s. Assam Pulp Mills Ltd. have been given a licence to set up a plant with an annual capacity of 312,000 tons of bamboo pulp at Lamsakhang, Assam. The scheme is under implementation and production is expected to commence in 1962-63.

2. M/s. Pulp and Paper Conversions Ltd. have been recommended for a licence to set up 15,000 tons per annum pulp plant at Dangs near Surat. The Capital Goods Committee has agreed to the release of foreign exchange under certain conditions but final arrangements for the import of the plant and equipment are yet to be made.

Although it would seem that the capacity licensed is in excess of the target recommended in the Plan, it is considered that due to the difficulties in arranging acceptable terms of foreign exchange, shortage of finance and other reasons, all the schemes licensed/recommended for licence are unlikely to materialise before the end of the Third Plan period. The position may have to be periodically reviewed to ensure effective execution of schemes so that the target set may be achieved and also to maintain continuity of expansion in the following years.

(ii) *Newsprint.*—A number of proposals for the establishment of additional newsprint capacity during the Third Plan have been approved or are at present under consideration. Details of these are given below:

1. M/s. Rohtas Industries have been given a licence to set up a newsprint factory based on imported pulp. The plant which is expected to be located in Maharashtra will have an annual capacity of 30,000 tons.* Though the firm has been allowed to negotiate directly with the D.L.F. authorities to secure the necessary foreign exchange, no final arrangements for import of plant and equipment have yet been made.

2. The scheme of M/s. Birla Gwalior (Private) Ltd., for the establishment of newsprint plant based on imported pulp has been approved by the Licensing Committee. The plant is expected to have a capacity of 30,000 tons per annum. No final arrangements for import of plant and machinery have been made so far. The firm has been permitted to negotiate directly with U. S. Exim Bank for a loan.

3. M/s. Shri Gopal Paper Mills Ltd. have been given a licence to set up a newsprint factory at Kangra in the Punjab based on soft wood available in the Himalayan region. The capacity of the plant is expected to be 30,000 tons per annum.

4. It has been agreed in principle to expand the capacity of Nepa Mills from 30,000 tons to 60,000 tons per annum. Detailed proposals are being worked out.

On the basis of the above schemes the annual capacity of the newsprint industry is expected to increase to 150,000 tons by 1965-66.

Further expansion of the newsprint industry will depend on the availability of adequate quantities of cellulosic raw materials in close proximity to possible locations and a clear view about the size of economic units in this field. On the basis of the data at present available, there are no new

*Subsequently M/s. Rohtas Industries have been permitted to expand their capacity to 60,000 tons per annum, based on 65% of bagasse and 35% of imported pulp.

sites which can support economic production of newsprint. It is proposed to undertake during the Third Plan period a comprehensive survey of forest resources with the assistance of the United Nations Special Fund. If such a survey indicates suitable locations, further consideration could be given during the Third Plan period to initiating proposals for the establishment of more newsprint factories and/or the expansion of the existing ones.

(iii) *Strawboard and other boards.*—Though the existing capacity is about 77,400 tons, 12 new units and 5 expansion schemes with a total capacity of about 54,200 tons have been licensed or recommended for licence under the Industries Act. (Details of these are given in Annexure II). Thus the total capacity licensed (including the existing capacity) is 131,600 tons. In licensing capacity in excess of the estimated requirements of 100,000 tons consideration has been given to such factors as the availability of raw materials and demand in specific regions. Further due to foreign exchange difficulties, shortage of finance and other reasons, it is unlikely that all the licensed schemes will materialise by the end of the Third Plan period. Even so, it would seem that there is no need to license further schemes for some time now in view of the large capacity already licensed. The position will have to be periodically reviewed in the light of the progress on the licensed schemes and the requirements as estimated above.

Exports.—Exports of paper are at present negligible being of the order of 2,500 tons per annum, mostly of cigarette tissues. With a view to boosting exports and testing the standing of the paper industry in international markets, the Development Council has agreed to take measures to export 5% of the production or a maximum of 15,000 tons of paper per year and to form an export pool for export promotion. As the position regarding the competitive ability of the Indian paper industry in the international market and the scope for exports are not clearly known, no provision has been made for additional capacity specifically to meet export needs.

Investment and employment.—It is estimated that a sum of about Rs. 75 crores will have to be invested in the paper and paperboard industry during the Third Plan period to achieve the capacity target of 820,000 tons. In estimating this investment, it has been assumed that half of the expenditure on schemes under implementation at the end of the Second Plan will spill over into the Third Plan. In addition, a further expenditure of Rs. 25 crores is expected to be incurred on the newsprint industry during the Third Plan period.

As regards foreign exchange the requirements have to be estimated keeping in view the expected availability of machinery from indigenous sources. A beginning has already been made with the manufacture of paper machinery indigenously. (Details discussed in the chapter on "Industrial Machinery").

Though it is expected that the industry will become self-sufficient in regard to plant and equipment by the end of the Plan period, a major contribution towards the supply of machinery from within the country can be expected only by about the middle of the Third Plan period. It will, therefore, be necessary to provide some foreign exchange for import of plant and equipment during the Third Plan period, particularly in the initial years.

On a rough basis it is estimated that foreign exchange of the order of Rs. 35 crores will be required during the Third Plan period for the import of plant and equipment including import of components for the paper machinery manufacturers.

The expansion of the industry is expected to provide employment for about 40,000 additional persons.

Pattern of growth of the industry.—Hitherto the development of the industry has been based almost entirely on conventional raw materials like bamboo and sabai grass. To take advantage of steam economy and also to provide for efficient chemicals recovery, it was considered that a minimum economic unit based on conventional raw materials should be of the size of 50 tons per day and with few exceptions, the existing paper plants are of this size or larger. However, with the expansion of the industry in the Second Five Year Plan period and the further new schemes already cleared, the available resources of conventional raw materials have been almost completely exhausted. In the further development of the paper industry there will have to be a major shift to new raw materials *e.g.*, bagasse, rice, straw, paper waste and other cellulosic materials which have not hitherto been exploited to any significant extent. Some of the existing units have already made a start in the use of bagasse by setting up plants for using bagasse pulp mixed with pulp produced from conventional raw materials. A few licences have also been given for the manufacture of paper based solely on bagasse or with mixture of bamboo or sabai grass. Similarly a number of licences have also been given or recommended for setting up small units based on straw, waste paper, rags etc.

The bamboo supplies available now are limited. Bamboo as a raw material for the production of rayon grade pulp is also being envisaged and *prima facie* it would seem that these limited supplies should preferably be earmarked for the production of rayon grade pulp, imports of which account at present for a considerable expenditure of foreign exchange. This underlines the importance of shifting from bamboo to bagasse for the manufacture of paper. It would, therefore, seem that additional capacity for paper will have to be closely coordinated with the expansion of the sugar industry. Areas abundant in the supply of bagasse should attract attention in the future for the location of additional paper units in the Third and subsequent Five Year Plans.

Whereas new large-scale paper units will have to graviate towards sugarcane areas, the possibility of establishing small-scale units based on other raw materials like straw, reeds and grass and producing paper essentially for local consumption will have to be fully explored.

Requirements of raw materials.—The main raw materials required by the paper industry are bamboo, sabai grass and other cellulosic materials, caustic soda and sulphur.

As already pointed out, the paper industry has uptil now been mainly based on conventional cellulosic raw materials like bamboo and sabai grass

but future schemes for the expansion of paper production (including newsprint) will have to rely on supplies of bagasse as the chief raw material. This applies particularly to large-scale units.

Prima facie, it should not be difficult to arrange for the use of bagasse in the paper industry, provided new units are located in the vicinity of sugar factories. The total supplies of bagasse from sugar mills by 1965-66 are expected to be of the order of 5·0 million tons on a wet basis. At present the sugar factories are not interested in the supply of bagasse to outside agencies as the price of coal in terms of fuel value is much higher than that of bagasse. Steps, therefore, will have to be taken to facilitate the release of bagasse for the manufacture of paper by providing alternative fuels to the sugar industry and making the switchover mutually advantageous to the two sectors concerned. Various measures are under consideration.

The requirements of caustic soda estimated at about 94,000 tons in 1965-66 on the basis of a production target of 700,000 tons of paper and paperboard and 120,000 tons of newsprint are expected to be met from indigenous sources by expansion of the caustic soda industry in the Third Five Year Plan. The requirements of sulphur estimated at about 9,000 tons are however expected to be only partly met from indigenous sources.

Research.—The Development Council has recommended that an institute for pulp, paper and allied industries should be set up supported by the industry and the Government to foster research, development and technology of the industry and also to coordinate the work done by other research organisation, on lines similar to that of the Textile Industry Research Association and the Indian Jute Mills Research Association.

The following table summarises the development of the paper and paper-board industry envisaged during the period of the Third Plan :

('000 tons)

	1960-61		1965-66	
	Annual rated Capacity	Production	Annual rated Capacity	Production
Paper and paperboard	410.0	343·2	820·0	700·0
Newsprint	30·0	22·9	150·0	120·0
Strawboard and other boards	77·4	54·5	90-100·0	70·0
Exports	1960-61—	2·5	1965-66—	15·0

ANNEXURE I

A. Large units licensed/approved by the Licensing Committee

Name of the Units	Location	Annual Capacity (tons)
(a) New Units		
Orissa		
M/s Straw Products Ltd.	Singhpur Road near Rayagada, Koraput Dt.	18,000
Madhya Pradesh		
M/s Orient Paper Mills Ltd.	Amlai	45,000
M/s Bilaspur Paper Mills Ltd.	Bilaspur	30,000
M/s Madhya Pradesh Paper & Pulp Mills Ltd.	Balaghat	18,000
Mysore		
M/s Mandya National Paper Mills Ltd.	Balagola	21,600
M/s Uggar Sugar Works Ltd.	Athani Belgaum	9,360
Bihar		
M/s Ashok Paper Mills Ltd.	Darbhanga	15,000
Madras		
M/s Papanasam Paper Mills Ltd.	Papanasam	9,000
M/s Century Paper Mills Ltd.	Madurai	6,000
M/s Seshasayee Paper & Boards Ltd.	Salem	20,000
Uttar Pradesh		
M/s Sarup Paper Mills	Muzaffarnagar	15,000
M/s The Northern India Paper Mills Ltd.	Meerut	27,000
M/s Delhi Cloth & General Mills	Meerut	36,000
M/s Hindustan Sugar Mills Ltd.	Golagokarannath	15,000
M/s Somani Pulp & Paper Mills Ltd.	Gorakhpur	15,000
Assam		
M/s Megna Mills Co. Ltd.	Silchar	30,000
Maharashtra		
M/s Jolly Bros. (P) Ltd.	Bhusawal	9,000
Punjab		
M/s Bedi & Co. (P) Ltd.	Panipat	30,000

Name of the Units	Location	Annual Capacity (tons)
(b) Substantial Expansions		
Mysore		
M/s Mysore Paper Mills Ltd.	Bhadravati	10,000
M/s West Coast Paper Mills Co. Ltd.	Dandeli	12,000
Maharashtra		
M/s Ballarpur Paper Mills Co. Ltd.	Ballarpur	27,000
Bihar		
M/s Rohtas Industries Ltd.	Dalmianagar	37,500
West Bengal		
M/s Bengal Paper Mills Co. Ltd.	Raniganj	11,400
Andhra Pradesh		
M/s Andhra Paper Mills Co. Ltd.	Rajamundhary	15,000
M/s Sirpur Paper Mills Ltd.	Kaghazanagar	11,400
Orissa		
M/s Titaghur Paper Mills Ltd.	Choudwar	6,000
	TOTAL OF (a) & (b)	499,260

B. Approved Small Paper Mills

Name of the Unit	Location	Annual Capacity (tons)	Type of paper to be produced
(a) New units			
Assam			
M/s Eastern Paper Industries	Jeypore	3,120	P.& W.(Printing & writing).
M/s Assam Paper Mills Ltd.	Gauhati	3,000	Do.
M/s India Paper Mills	Gauhati	3,000	Do.
M/s Assam Paper & Board Mills	Near Lumding Lamaskhang.	3,000	Do.
M/s Brahamputra Pulp and Paper Mills	Gauhati	3,000	Do.

Name of the Unit	Location	Annual Capacity (tons)	Type of paper to be produced
West Bengal			
M/s East India Paper Mills	Kalyani	3,300	P. & W. (Printing & writing.)
M/s Babria Bros. (P) Ltd.	Calcutta	900	Kraft liner & straw papers.
M/s East End Paper Industries	Bansbaria	3,000	P. & W.
M/s West Bengal Paper Mills	Kalyani	1,800	Do.
M/s Sri Sri Mohan Paper Mills	Calcutta	1,800	Do.
M/s Aryavarta Industries (P) Ltd.	Kalyani	1,800	Do.
M/s Pioneer Plastics Works (P) Ltd.	Calcutta	1,560	Cable insulating paper & Carbonising tissues.
M/s Shri Gajanan Khaitan	24 Parganas	3,120	P. & W.
M/s Union Paper & Board Mills Ltd.	Sinthi	2,400	Do.
M/s Card Board Box Mfg. Co.	24 Parganas	3,000	Kraft liner & straw paper.
M/s Priti Paper Board Mills (P) Ltd.	Alipore	1,800	P. & W.
Bihar			
M/s Bhagwan Devi Paper Mills Ltd.	Barauni	1,800	Do.
M/s Thakur Paper Mills	Jitwarpur	3,000	Do.
M/s Krishna Paper Mills (P) Ltd.	Sakrigali Ghat	4,500	Do.
M/s Bihar Paper Mills (P) Ltd.	Patna or Ranchi	3,000	Do.
Orissa			
M/s Orissa Paper Mills (P) Ltd.	Barma (Distt. Sambalpur).	3,000	Do.
Uttar Pradesh			
M/s Anand Paper Industries (P)Ltd.	Ghaziabad	4,680	Do.
M/s R. S. Madho Ram & Sons	Do.	3,000	Do.
M/s Bishnu Dayal Kajriwal	Kanpur	3,600	Do.
M/s Vindhya Paper Mills	Kanpur/Varanasi	1,500	Imitation art paper.
M/s White Paper Mills	Kanpur	1,800	P. & W.
M/s Swadeshi Paper & Strawboard Mills Ltd.	Varanasi	1,872	Do.
M/s Modi Sugar Mills Ltd.	Modinagar	3,000	Do.
Punjab			
M/s Girdhar Lal Jagdish Ltd.	Chandigarh	1,200	Do.
M/s Commonwealth Spg. & Knitting Mills (P) Ltd.	Ludhiana	3,000	Do.

Name of the Unit	Location	Annual Capacity (tons)	Type of paper to be produced
M/s Oswal Paper Mills	Chandigarh	3,000	P. & W.
M/s Punjab Paper Mills (P) Ltd.	Chandigarh or Bhahadurgarh.	3,000	Do.
M/s Everest Paper Mart	Sampla (Rohtak)	3,600	Do.
M/s R. D. Bhagat.	Faridabad	1,200	Coated papers.
M/s Commonwealth Spg. & Knitting Mills (P) Ltd.	Ludhiana	3,000	Grease proof and glassine papers.
M/s Amin Chand Pyarela	Faridabad or Chandigarh.	3,000	P. & W.
M/s Commonwealth Spinning & Knitting Mills Ltd.	Ludhiana	7,200	Insulating paper.
Himachal Pradesh			
M/s New Era Hindustan Paper Mills	Paonta	3,000	P & W.
Rajasthan			
M/s Rajasthan Paper (P) Ltd.	Jaipur	1,800	Do.
M/s Rajasthan Paper Mills (P) Ltd.	Jaipur	4,320	Do.
M/s The Poddar Mills Ltd.	Kotah	3,000	Do.
Delhi			
M/s Qulwant Rai & Sons (P) Ltd.	Baddarpur (Delhi).	3,000	Do.
Madhya Pradesh			
M/s Madhya Pradesh Co-operative Paper Mills Ltd.	Raigarh	3,600	Do.
M/s Champak Lal Lalwani	Vidhisha	2,700	Do.
M/s Straw Products Ltd.	Bhopal	5,400	Do.
M/s Kellsons	Obaidullaganj	3,000	Do.
Maharashtra			
M/s Jyoti Paper Mills Ltd.	Karjat	3,000	Do.
M/s India Paper Mfg. Co., Bombay	Raha, Kolaba Distt.	1,800	Do.
M/s Sri Ram Paper Mills Co.(P)Ltd.	Tansa	1,560	Do.
M/s Baldota Brothers	Kalyan	1,800	Do.
M/s Oriental Timber Trading Corporation (P) Ltd.	Ambarnath, Thana Distt.	1,500	Do.
M/s India Rotoprints Cone & Cube Paper Mfg. Co.	Pimpri	3,600	Base paper for Textile Cones.
M/s Dwarkadas J. Patel.	Jogeshwari	1,440	Tracing paper.

Name of the Unit	Location	Annual Capacity (tons)	Type of paper to be produced
M/s Afsons Industrial Corpn.P Ltd.	Wasrang-gaon	2,400	P. & W.
M/s Kantilal K. Shah	Karjat	1,800	Do.
M/s Lal & Co.	Raha	3,000	Grease proof & Glassine
M/s Rajaramka Pulp & Paper Mills Ltd.	Tumsar	3,000	P. & W.
M/s J. B. Thakar, Giripeth	Gondia	3,600	Do.
M/s Paper Products Ltd.	Thana	4,800	Do.
M/s Eastern Traders Corpn.	Khapoli	3,600	Do.
M/s Shahani & Co.	Bombay	4,500	Do.
M/s Lal Paper Mills (India) Private Ltd.	Kalyan	3,000	Do.
M/s Sarswati Paper Mills (P) Ltd.	Kalyan	3,000	Do.
M/s Premier Paper Mills	Jogeshwari	2,160	Do.
M/s Mahagaldas N. Verma (P) Ltd.	Kurla	1,360	Coated paper.
M/s P. C. Bhandari & Co. (P) Ltd.	Tehsil Raha	1,680	Insulating paper.
M/s Niagara (Overseas) (P) Ltd.	In Maharashtra	1,500	Do.
M/s Kwality Paper Mills	Kalyan	1,800	Tissues, Bonds, Bank Index board and specialities.
M/s R. B. Seth Shree Ram Durga Prasad.	Tumsar	1,500	P. & W.
M/s Rajabahadur Motilal Poona Mills Ltd.	Kalyan	3,000	Do.
Gujarat			
M/s Rohit Pulp Paper Mills Ltd.	Pardi (Surat)	3,000	Do.
M/s Jayant Paper Box Factory	Utran	3,600	Kraft Liner paper.
M/s Girdharilal Damodar Dass (P)Ltd.	Ahmedabad	3,600	P. & W.
M/s Hind Paper Products	Distt. Surat	1,800	Do.
M/s Bombay Steel & Wire Products	Baroda	1,600	Aluminium coated paper.
M/s Bhasker T. Patel.	Bhavnagar/ Baroda.	5,400	Photographic base paper.
Andhra			
M/s T. H. Gangappa & Son	In Andhra Pradesh.	1,500	P. & W.

Name of the Unit	Location	Annual capacity (tons)	Type of paper to be produced
Mysore			
M/s The Karnatak Paper Mills Ltd. Bangalore.	Bangalore .	1,500	P. & W.
M/s A. G. Senapathy & Co. . .	Nanjangud .	840	Elephantide Electrical Insulating paper.
Madras			
M/s Amravathi Sri Venkatasa Paper Mills (P) Ltd.	Amaravathinagar Udamalpet.	3,000	P. & W.
M/s Madras Paper Mills (P) Ltd. .	Pomeri . .	1,500	Do.
M/s Lakshmi Paper Industries . .	Salem . .	1,400	Coated paper.
Kerala			
M/s Joseph K. Thomas. .	Central Kerala	3,000	Grease proof and glassine.
(b) Substantial Expansion			
Punjab			
M/s Delhi Pulp Industries . .	Faridabad .	4,680	Tissue paper grease proof & glassine.
M/s Bharat Carbon & Ribbon Manufacturing Co.	Faridabad	4,000	Writing & Printing.
Maharashtra			
M/s Pudumji Paper Mills Ltd.	Khapoli . .	3,900	Grease proof & glassine.
	TOTAL OF (a) & (b	236,192	

ANNEXURE II

List of Schemes for Straw Board and other Boards

Name of the Scheme	Location	Annual Capacity (tons)
(a) New Schemes		
Andhra		
M/s Sri Venkatesware Paper & Straw Board Mills	Tirupathi	3,000
Gujarat		
M/s Star Trading Private Ltd.	Rajkot	4,500
M/s Simplex Board & Paper Products	Nandurbar	2,200
M/s Shri Laxmi Paper Mills (P) Ltd.	Haveli	2,496
M/s Hemant Paper Mills & Industries (P) Ltd.	Variav	3,000
Maharashtra		
M/s Bharat Straw Board Mfg. Co.	Kalyan Distt. Thana	4,800
U.P.		
M/s Simbhaoli Sugar Mills P) Ltd.	Simbhaoli	3,000
M/s Swadeshi Sugar Suppliers Private Ltd.	Varanasi	3,120
West Bengal		
M/s Priti Paper Board Mills (P) Ltd.	Alipore	1,080
M/s Durga Paper & Board Mills (P) Ltd.	Pandooah Distt. Hooghly.	3,600
Madras		
M/s Cauvery Card Boards	Kokkrayanpet	3,000
Mysore		
M/s Natwar Lal Shamaldas & Co.	Dandel	3,000
(b) Substantial Expansion		
West Bengal		
M/s Himalaya Paper & Board Mills	Calcutta	2,100
M/s Bharat Board Mills Ltd.	Dum Dum	..
U.P.		
M/s Straw Board Mfg. Co.	Saharanpur	7,000
Maharashtra		
M/s Western India Paper & Board Mills	Vikhroli	1,800
M.P.		
M/s Ratlam Straw Board Mills Private Ltd.	Ratlam	4,500.
	TOTAL OF (a) & (b)	54,196

56. CEMENT

1. Review of progress in the Second Plan:

Targets.—The Second Plan envisaged that the capacity of the cement industry should be stepped up to 16·0 million tons per annum to achieve a production of 13·0 million tons in 1960-61. Within the overall capacity, a production target of 8 lakh tons was envisaged for slag cement.

Capacity and production.—At the end of the First Plan, there were 27 units in the industry with capacity of 4·94 million tons. By the end of the Second Plan period, the number of units had risen to 34 and the total installed capacity to about 9·16 million tons. The State-wise distribution of this installed capacity as compared with that of 1955-56 is indicated below :

State	1955-56 No. of Units	1955-56 Installed capacity (lakh tons)	1960-61 No. of Units	1960-61 Installed capacity (lakh tons)
Andhra	2	1·89	5	9·46
Bihar	6	11·16	7	17·14
Maharashtra Gujarat	4	6·92	5	10·92
Kerala	1	0·50	1	0·50
Madhya Pradesh	2	4·10	3	8·81
Madras	3	6·35	4	12·14
Mysore	3	5·60	3	8·63
Orissa	1	1·65	1	3·65
Punjab	2	3·70	2	6·35
Rajasthan	2	5·25	2	11·66
U.P.	1	2·31	1	2·31
TOTAL	27	49·43	34	91·57*

*Includes additional capacity achieved as a result of rationalisation and improved efficiency by the cement factories at :—

Chaibasa, Bihar	10,000 tons.
Sahabad, Mysore	20,000 tons.
Kymore, Madhya Pradesh	10,000 tons.

The increase in installed capacity resulted from the completion of 7 new units and the expansion of 16 existing ones. The progress made in installing additional capacity during the period under reference was as shown below :

	million tons
Capacity as on 1-4-56	4·94
Capacity as in 1956-57	5·89
Capacity as in 1957-58	6·92
Capacity as in 1958-59	7·78
Capacity as in 1959-60	8·35
Capacity as on 1-4-61	9·16

The rate of expansion slackened in the last two years of the Plan mainly on account of slack demand for cement coupled with foreign exchange difficulties. In 1958 at the time of the appraisal of the Plan, the capacity target for the Second Five Year Plan, was revised downwards to a working target of 11·0 million tons per annum. As against this, the capacity reached by the end of the Plan period was 9·16 million tons. Details of new schemes and expansions completed during the Second Plan period are given in Appendix 1.

Production.—An increase in production of cement from 4·6 million tons to 13·0 million tons was visualised in the Second Plan. The actual production of cement rose from 4·6 million tons in 1955-56 to about 7·8 million tons in 1960-61. The figures of production during the last few years are given below :

	million tons
1955-56	4·6
1956-57	5·1
1957-58	5·9
1958-59	6·3
1959-60	7·2
1960-61	7·8

Foreign trade in cement.—There were imports of cement on a restricted basis up to October, 1959 and since then they have been completely stopped.

Small quantities of cement have been exported to Pakistan, Ceylon, Cambodia, South Vietnam, Persian Gulf ports etc. The imports and exports of cement during the Second Plan period are shown below :

('000 tons)

	Import	Export
1955-56	13	57
1956-57	152	7
1957-58	285	35
1958-59	11	90
1959-60	Negligible	181
1960-61	..	105

Demand and off-take.—In view of the large construction programme envisaged under the Second Plan, it was expected that the internal demand for cement would rise sharply and might go up to 12·0 or 12·5 million tons by 1960-61. It was further estimated that, it might be possible to export substantial quantities of cement from factories situated near ports. The experience in regard to off-take of cement during the first three years of the Plan period has shown that the Plan forecast was on the high side. The lag in demand was partly due to inadequate supply of steel and foreign exchange difficulties which led to some of the construction programmes being retarded or postponed. Efforts were made to increase internal consumption by relaxing previous restrictions on the use of cement that had been imposed in the days of scarcity and withdrawing control over retail distribution. The further licensing of capacity as well as the issue of import licences in the case of schemes that had already been licensed was slowed down till the end of 1959.

Since early in 1960 demand has revived and with steel becoming rather more easily available for constructional activities, it is expected that this trend will continue. The following table indicates the indents placed by consumers and allotment of cement during the period of the Second Five Year Plan. The indents placed by consumers during the scarcity years seem to have been inflated since with the easy supply position of cement in 1958-59 and 1959-60 these have come down to a considerable extent.

(lakh tons)

	Indents	Allotment
1956-57	125·39	58·65
1957-58	127·82	65·48
1958-59	86·10	72·41
1959-60	79·02	79·02
1960-61	107·16	83·76

The rising trend in the demand for cement in the first quarter of 1961 is observed from the following data pertaining to 1960-61 :

(lakh tons per month)

		Production	Indents placed by consumers	Allotment
April, May, June	Period II,/1960	6·4	6·90	6·90
July, August, September	Period III/1960	6·1	6·99	6·99
October, November, December	Period IV/1960	6·9	9·11	6·59
January, February, March	Period I/1961	7·0	12·72	7·44

It will be seen that while the monthly demand indents for period I of 1961 were for about 12·7 lakh tons, the availability was only about 7 lakh tons per month, thereby leaving a gap of about 5 lakh tons per month. The real gap must have been narrower taking into account the inflation in demands due to the shortage. Making due allowance for this factor, the demand in 1960-61 may be realistically assessed at about 8·7 to 8·8 million tons per annum.

Distribution, selling price and cost structure.—Till the 1st July, 1956, cement distribution was effected through selling agents of the producers in accordance with the overall allocation made by the Ministry of Commerce and Industry. From that date, the State Trading Corporation became responsible for the sale and distribution of both imported and indigenous cement and it became necessary to fix prices payable to producers on an ex-works basis. According to the arrangements in force since then, all cement manufacturing units sell their production to the State Trading Corporation. In their 1958 Report, the Tariff Commission recommended different ex-works prices for different factories and those prices were made applicable from 1st July, 1958 for a period of three years. The uniform price at which cement was sold in the country during this period was Rs. 117·50 per long ton which was made up of the ex-works price of Rs. 58·10 per long ton payable to factories, excise duty of Rs. 24 per long ton, an element to provide for equalised freight, packing charges, commission to selling agents and S. T. C.'s

remuneration. In view of the scarcity and rising prices of jute bags, the element of cost of packing charges was separated with effect from the 20th February, 1961 from the equalised price and the equalised price per tonne of naked cement fixed at Rs. 104·60. Packing charges are fixed separately from quarter to quarter and have ranged between Rs. 17 and Rs. 19 per tonne. The increase in excise duty effected since May, 1957 is an important element accounting for the rise in the selling price.

The industry represented that costs of production had increased since the last cost enquiry by the Tariff Commission in 1958 due to increased cost of raw materials, power, freight, labour etc. The decision to implement the recommendations of the Wage Board for cement industry also implied an increase in the cost of production. Furthermore, a few new units had since gone into production and some schemes of expansion had also materialised and the price fixed in each case provisionally by the Government of India was considered to require a fuller examination. With a view, therefore, to determining the fair ex-works prices from 1st July, 1961, the Government of India requested the Tariff Commission in October, 1960 to conduct a fresh enquiry.

Capital and labour.—The investment envisaged during the Second Plan period for expansion of capacity from 4·94 million tons to 16 million tons was of the order of Rs. 85 crores. A later assessment placed the requirements at about Rs. 110 crores. The actual investment during the Second Plan period is estimated at about Rs. 45 to 50 crores. The foreign exchange element is reckoned at Rs. 25 to 30 crores.

As against 40,000 persons estimated to have been employed in the industry in 1955-56 the present number is placed at 55,000.

Ancillary developments.—During the First Plan period there was no capacity in the industry for slag cement whereas the industry at the end of the Second Plan period an annual installed capacity of 18,000 tons per annum for slag cement. Since then, a scheme for substantial expansion of the existing cement factory at Chaibasa (Bihar) for the production of 170,000 tons of slag cement per year has been completed. Further capacity of about 1·23 million tons per annum for slag cement has been licensed or approved for licence so far at Durgapur, Sindri, Durg, Rajgangpur, Dalmianagar and Japla.

The manufacture of white cement by M/s. Travancore Cements at Kottayam and A. C. C.'s factory at Porbandar is also one of the new developments during the Second Plan period and further capacity of about 0·42 lakh tons is projected.

Other developments worth mention are the commissioning of the floatation plant installed at A. C. C.'s factory at Chaibasa (Bihar) for beneficiation of limestone and of their coal washing plant at Nowrozabad colliery in July and February, 1960 respectively. The entire production of the Nowrozabad colliery enriched through washing is now utilized by A. C. C.'s cement works at Kymore.

Problems and experience of the industry.—Temporary difficulties due to shortage of coal supplies and of rail transport both for the carriage of raw materials inwards and the movement of cement outward occurred from time to time. Shortage of quality coal has led some of the factories located in the Southern region *e.g.*, M/s. Travancore Cement, to switch over to oil.

Supply of quality limestone in certain areas is limited. With the increased demand for limestone by various other industries, for example the iron and steel industry, the cement industry will have to devote greater attention to its supply of limestone by intensification of surveys and development. It has been suggested that the Geological Survey of India should undertake a survey of new sources of limestone particularly in areas, where there are at present no cement factories, like West Bengal, North Bihar, Kashmir, Assam, Himachal Pradesh as well as areas in the Punjab, Rajasthan, Andhra, Saurashtra and Madras. There are proved deposits of low grade limestone at several places and it may be necessary for the industry to adopt beneficiation processes to upgrade the quality of the output from the mines. However, as an alternative raw material, it is suggested that the industry should draw increasingly upon supplies of blast furnace slag available from the iron and steel plants which is an important industrial byproduct and can be utilised if it is granulated as it emerges from the blast furnaces. A committee appointed by the Ministry of Commerce and Industry on slag cement has examined the availability of slag *vis-a-vis* production of portland blast furnace slag cement and according to the findings of the committee, production of slag cement can, in the short term, augment the availability of cement more expeditiously than setting up additional capacity for ordinary portland cement. Moreover the requirements of foreign exchange for importing plant and equipment for slag cement are substantially lower than that entailed in developing an equivalent capacity for clinker-based cement.

II. Programme of Development in the Third Plan :

Estimated requirements.—During the last few years the average rate of annual increase in consumption has been about 10%. The installed capacity of the industry has also increased at a somewhat similar rate. It was the view of the industry that in projecting the demand for the Third Plan period, it would be correct and realistic to apply the same geometric rate of annual increase, for such a rise would now be operating on an increasingly higher rate from year to year. At that time it was assumed that the demand in 1960-61 would be around 8 million tons. On this basis, an average annual increase of 10% would lead to requirements of about 13 million tons in 1965-66 and this target was adopted in the Draft Outline. Since, however, demand in 1960-61 has increased more than was expected, it is possible that the target may have to be revised upwards. Furthermore the target makes no provision for exports. It is proposed to review the entire question after watching the trends during 1961-62. The possibility of exports has also to be kept in view. In 1959-60, 181,000 tons were exported. In spite of keen competition from other countries it would be reasonable to aim at raising exports to about 3 lakh tons by the end of the Third Plan. This target should also cover clinker, the penultimate product in cement manufacture.

Target of capacity and production.—With a view to meeting the requirements of cement discussed above the capacity and production of the industry by 1965-66 have been visualised at 15 and 13 million tons per annum respectively.

Schemes under implementation.—The following schemes have been completed or are expected to be completed during the first year of the Third Plan, *viz.*, 1961-62 :

Name of the firm	Location	Nature of the scheme	Annual capacity (tons)
M/s. A. C. C.	Chaibasa (Bihar)	SE	170,000* (slag cement)
U. P. Govt. Cement Factory	Churk (U.P.)	SE	231,000
M/s. Mysore Cements Ltd.	Ammasandra (Mysore)	NU	100,000
M s. K. C. P. Ltd.	Macherla (Andhra Pradesh)	SE	150
	TOTAL		651,000

*Completed in June 1961.

Apart from the schemes mentioned above, a number of other projects with a total capacity of about 5·43 million tons have been licensed or approved for grant of licence. These schemes fall into three categories *viz.*, (1) those already covered fully or partially by import licences, (2) those expected to be implemented mainly with indigenous machinery and (3) those not yet covered by import licence or expected to be implemented with indigenous machinery. The details of the above categories of schemes are given in Appendix II.

Additional capacity required.—The production of cement envisaged from year to year, the installed capacity needed to ensure such production

and the capacity likely to be available on the basis of import licences issued so far are shown in the following table:

(million tons)

	Estimated demand	Capacity needed for production corresponding to the demand estimate	Availability of capacity on the basis of import licences issued so far and the delivery of indigenous machinery
1961-62	8·8	9·8	9·81
1962-63	9·7	10·8	10·18
1963-64	10.7	11·9	11·26
1964-65	11·8	13·1	12·66
1965-66	13·0	15·0	12·66

It will be noted that from the second year of the Third Plan, additional capacity over and above the capacity likely to be achieved as given in Col. 4 of the above table would have to be provided if the estimated requirements of cement are to be met in full. The provision of this additional capacity would necessitate either the release of further foreign exchange for import of machinery or the stepping up of the output of indigenous machinery.

The capacity expected to be achieved on the basis of schemes covered so far by import licences and those so far selected for implementation based mainly on indigenous machinery would be of the order of 12.66 million tons. The gap between the availability of capacity on this basis and the capacity target of 15 million tons would, therefore, be about 2·34 million tons. However, if the schemes with a total additional capacity of about 2·58 million tons which have already been licensed or approved for licence but yet to be selected for implemntation are also taken into account, the total availability of capacity would be about 15.24 million tons per annum. Viewed against the capacity target of 15 million tons per annum, there is apparently little scope for licensing further capacity except to provide against possible casualties.

Investment.—The total investment required for the achievement of the planned capacity of 15 million tons is estimated at Rs. 55 to 60 crores.

It has been estimated that the foreign exchange required for fabricating a standard sized cement plant in India at the workshops of one of the indigenous cement machinery manufacturers would be Rs. 50 lakhs. On this basis, the foreign exchange required for manufacturing cement plants for the licensed capacity of 1,881,000 tons would be about Rs. 5.5 crores. The licensed capacity of 2,575,000 tons, which is neither covered by import licences nor by orders of indigenous machinery manufacturers, will have to be set up either by import of complete plants or by allowing the producers/ cement machinery manufacturers to fabricate them in India by allowing import of the minimum amount of components. It has been estimated that for manufacturing a standard sized plant in this way, the foreign exchange required would be Rs. 75 lakhs for a new unit or Rs. 45 lakhs for substantial expansion. On this basis, the foreign exchange required for a capacity of about 2.58 million tons would be about Rs. 7.75 crores. Thus the total foreign exchange required during the Third Plan period comes to Rs. 13.25 crores.

Additional employment.—It is estimated that the installation of additional capacity of about 6 million tons during the Third Plan period will potentially give rise to the employment of about 18,000 persons.

Raw materials.—A rough indication of the raw material and power requirements of the industry based on the phasing of production envisaged during the Third Plan period is given in the table below:

Main raw materials	Unit	1961-62	1962-63	1963-64	1964-65	1965-66
Limestone* . .	lakh tons	141	155	171	189	210
Gypsum . .	lakh tons	3·5	3·9	4·3	4·7	5·2
Coal . . .	lakh tons	26·5	29·0	32	35·5	40
Clay and Laterit .	lakh tons	8·8	9·7	10·7	11·8	13
Power . . .	million KWh	968	1,067	1,177	1,298	1,430

*The requirements of limestone can be brought down by the use of slag.

The following table summarises the development programme of the industry:

million tons

	1960-61	1965-66
Capacity	9·2	15·00
Production	7·8	13·00
Exports	0·1	0·3

APPENDIX I

Statewise installation of additional capacity for cement during the Second Five Year Plan period

Name of the unit	Location	Nature of the Scheme	Capacity installed during the Second Plan period (lakh tons)
1	2	3	4
Andhra Pradesh			
M/s. K.C.P. Ltd. (Ramakrishna Cements)	Macherla	New unit	1·00
M/s. A. C. C. Ltd.	Mancherial	Do.	3·30
M/s. Panyam Cements Mineral Industries Ltd.	Panyam	Do.	0·63
M/s. A. C. C. Ltd.	Kistna	SE	1·65
M/s. Andhra Cement Co. Ltd.	Vijayawada	SE	0·99
	TOTAL		7·57
Bihar			
M/s. Ashoka Cement Ltd.	Dalmianagar	New Unit	2·80
M/s. A. C. C. Ltd.	Chaibasa	SE	1·10
M/s. A. C. C. Ltd.	Sindri	SE	1·00
M/s. Kalyanpur Lime & Cement Works Ltd.	Banjari	SE	1·08
	TOTAL		5·98
Gujarat			
M/s. Saurashtra Cement & Chemical Industries Ltd.	Ranavav	New Unit	2·00
M/s. Shree Digvijay Cement Co. Ltd.	Sikka	SE	2·00
	TOTAL		4·00
Madhya Pradesh			
M/s. Birla Jute Mfg. Co. Ltd.	Satna	New unit	2·48
M/s. A. C. C. Ltd.	Kymore	SE	2·23
	TOTAL		4·71

1	2	3	4
Madras			
M/s. Madras Cements Ltd.	Tulukappatti	New Unit	0·66
M/s. India Cements Ltd.	Talaiyuthu	SE	3·48
M/s. Dalmia Cement (Bharat) Ltd.	Dalmiapuram	SE	1·65
	TOTAL		5·79
Mysore			
M/s. Bagalkot Cement Co. Ltd.	Bagalkot	SE	1·00
Mysore Iron & Steel Works	Bhadravati	SE	0·18
M/s. A. C. C. Ltd.	Shahabad	SE	1·85
	TOTAL		3·03
Orissa			
M/s. Orissa Cement Co. Ltd.	Rajagangpur	SE	2·00
Punjab			
M/s A. C. C. Ltd.	Surajpur	SE	1·00
M/s. Dalmia Dadri Cement Co. Ltd.	Charkhi Dadri	SE	1·65
	TOTAL		2·65
Rajasthan			
M/s. Jalpur Udyog Ltd.	Sawai Madhopur	SE	6·41
	GRAND TOTAL		42·14

APPENDIX II

Schemes licensed or approved

Name of the firm	Location	Nature of the scheme	Annual capacity (tons)
1	2	3	4
(a) Schemes covered fully or partially by import licences.			
J. & K. Mining and Mineral Products Corporation.	Wuyan (Jammu & Kashmir)	New unit	20,000
M/s. India Cements Ltd.	Vizianagaram (Andhra Pradesh)	Do.	200,000
M/s. V. Ramakrishna & Sons	Thiruvottiyur (Madras)	Do.	16,500 (white & coloured cement)
M/s. Assam Cements Co. Ltd.	Cherrapunji (Assam)	Do.	82,500
M/s. Chorwad Cement Factory	Veraval (Gujarat)	Do.	49,500
M/s. Madras Cements Ltd.	Tulukappatti (Madras)	SE	132,000
M/s. Birla Jute Mfg. Co. Ltd.	Satna (Madhya Pradesh).	SE	270,000
M/s. Shree Digvijay Cement Co. Ltd.	Sikka (Gujarat)	SE	200,000
	TOTAL		970,500
(b) Schemes licensed or approved for licence and expected to be implemented mainly with indigenous machinery			
M/s. A.C.C. Ltd., Bombay	Durg (Madhya Pradesh)	New Unit	165,000
M/s. Tendulkar Industries Ltd., Bombay	Rajur (Maharashtra)	Do.	240,000
M/s. Andhra Cement Co. Ltd., Madras	Nadikudi (Andhra Pradesh)	Do.	198,000
M/s. A.C.C. Ltd., Bombay	Keymore (Madhya Pradesh)	SE	25,000 (white & coloured cement)
Ditto.	Ditto.	SE	177,000
Ditto.	Dwarka (Gujarat)	SE	115,000
Ditto.	Madukkarai (Madras)	SE	120,000
Ditto.	Barmore (Madhya Pradesh)	SE	40,000
Ditto.	Khalari (Bihar)	SE	70,000

1	2	3	4
M/s. Bagalkot Cement Co. Ltd., Bombay	Bagalkot (Mysore)	SE	20 ,000
M/s. Mysore Cements Ltd., Bangalore	Ammasandra (Mysore)	SE	100,000
M/s. Saurashtra Cement & Chemicals Ltd.	Ranavav (Gujarat)	SE	200,000
M/s. Panyam Cement & Mineral Industries Ltd.	Panyam (Andhra Pradesh)	SE	132,000
M/s. Kalyanpur Lime & Cement Works	Banjari (Bihar)	SE	99,000
	TOTAL		1,881,000

(c) Schemes not yet covered by import licence or expected to be implemented with indigenous machinery

M/s. Durgapur Cement Co. Ltd.	Durgapur (West Bengal)	New unit	240,000 (slag cement)
M/s. A.C.C. Ltd., Bombay	Sindri (Bihar)	SE	170,000 (slag cement)
M/s. A.C.C. Ltd., Bombay	Porbandar (Gujarat)	SE	123,000
M/s. A.C.C. Ltd., Bombay	Durg (Madhya Pradesh)	SE	85,000 (slag cement)
M/s. Assam Cements Ltd.	Cherrapunji (Assam)	SE	66,000
M/s. Sone Valley Portland Cement Co. Ltd.	Japla (Bihar)	SE	231,000
M/s. Orissa Cement Co. Ltd.	Rajgangpur (Orissa)	SE	360,000 (slag cement)
M/s. Rohtas Industries Ltd.	Dalmianagar (Bihar)	SE	220,000 (slag cement)
M/s. Sone Valley Portland Cement Co. Ltd.	Japla (Bihar)	SE	170,000 (slag cement)
Shri Ramaniklal B. Shah	Bhavnagar (Gujarat)	New unit	50,000
M/s. Birla Gwalior Private Ltd., Calcutta	Chitorgarh (Rajasthan)	Do.	165,000
M/s. Bharat Cement Works Private Ltd., Bombay.	Port Albert Victor (Gujarat)	Do.	165,000
M/s. Surrendra Overseas Private Ltd., Calcutta.	Near Pathankot (Punjab)	Do.	100,000
M/s. Mahavir Industries Ltd., Bombay	Baroda (Gujarat)	Do.	100,000
M/s. India Cements Ltd., Madras	Sankaridrug (Madras)	Do.	165,000
M/s. A.C.C. Ltd., Bombay	Drug (Madhya Pradesh)	SE	165,000
	TOTAL		2,575,000

57. REFRACTORIES

I. Review of Progress in the Second Plan :

Targets.—On the basis of a demand estimate of 8 lakh tons and assuming an average operational efficiency of 80 per cent, a capacity target of 10 lakh tons by 1960-61 was envisaged for refractories under the Second Plan. It was further intended that the break-up of the overall production target should match with the demand for the different categories of refractories and a balance thus be achieved between the indigenous supply and demand for these essential products. In the report on the Reappraisal of the Plan (May, 1958) this industry was recommended a high priority for the release of foreign exchange for capital goods outside the 'core' projects in the public and private sectors.

Capacity and production.—At the end of the First Plan there were 31 units manufacturing refractories in the country with a total installed capacity of 4.44 lakh tons per annum. The products of the industry were mainly fireclay refractories, silica bricks and sillimanite refractories in diverse shapes and sizes. Small tonnages of chrome and insulating bricks were also produced. As a result of new developments in the last five years, the industry has achieved by 1960-61 an installed capacity of 8·2 lakh tons which was distributed over 46 units. The State-wise and type-wise distribution of this capacity as in 1955-56 and at the end of the Second Plan is indicated below :

Statewise distribution

States	1955-56		1960-61	
	No. of units	Annual capacity ('000 tons)	No. of units	Annual capacity ('000 tons)
Bihar	8	241·7	12	322·5
Bombay	6	29.4	7*	36·6
Delhi	2	9·8	1	7·9
Kerala	1	1·4	1	1·4
Madhya Pradesh	5	37·6	6	59·4
Madras	2	7·5	5	70·5
Mysore	3	8·6	3	8·6
Orissa	1	12·0	3	167·0
Punjab	..	..	1	2·4
Rajasthan	..	..	1	1·2
West Bengal	3	96·0	6	140·4
TOTAL	31	444·0	46	817·9

*Maharashtra and Gujarat.

Type-wise distribution

Type of Refractories	1955-56 ('000 tons)	1960-61 ('000 tons)
(i) Bricks & Shapes —		
Firebricks	320·0	537·4
Silica refractories	30·0	70·0
Basic refractories	10·0	44·0
High alumina refractories	10·0	10·0
Insulating refractories	4·0	6·4
TOTAL OF (i)	374·0	667·8
(ii) Others—		
Fire cement and mortar	70·0	85·8
Dead burnt magnesite	Nil	64·3
GRAND TOTAL	444·0	817·9

It will be observed that the capacity of the industry almost doubled during this quinquennium. The installation of additional capacity of about 3.8 lakh tons was on the basis of the completion or near-completion of 16 new units and expansion of 9 existing undertakings (*vide* Annexure I at the end). The progress recorded in installing additional capacity during the Second Plan period was as follows :

(as on 1st April)	Annual capacity in lakh tons
1956	4·44
1957	4·64
1958	4·98
1959	7·11
1960	8·01
1961	8·18

The actual production of refractories rose from 2·88 lakh tons in 1955-56 to 5·5 lakh tons in 1960-61 as shown below :

	Quantity (lakh tons)
1955-56	2·88
1956-57	3·29
1957-58	3·88
1958-59	4·48
1959-60	5·10
1960-61	5·50

The bulk of production has been in the field of fireclay refractories till recently. Due to the recent installation of a few modern plants and substantial expansion of some of the existing factories, large-scale manufacture of silica and basic refractories has also been taken in hand. Nevertheless, it cannot be said that the indigenous supply position of refractories is comfortable, because production has lagged behind demand particularly in the field of special steel plant refractories like blast furnace and ladle refractories. An important reason for this short-fall is the fact that the development of the steel industry preceded that of the refractory industry, and also that during the Second Plan period the steel plants were obliged to use refractories conforming to specifications obtaining in the country of the collaborators which differed materially from the specifications of refractories made in the country. It was not possible for the Indian refractory industry to build up additional capacity firstly in time for meeting the constructional requirements emerging from the development of the steel industry, and secondly to produce refractories according to an altogether different set of specifications. Some improvements in this direction have lately taken place with the efforts of the Panel on Refractories and the Indian Standards Institution which has formulated commonly acceptable specifications for certain important types of steel plant refractories. There is, therefore, now an increasing utilisation of indigenous refractories.

The break-up of the indigenous production in terms of fireclay, silica, basic and other categories of refractories in the last three years of the Second Plan has been assessed as follows :

('000 tons)

	Fireclay	Silica	Basic	Others	Total
1958-59 . . .	350.5	41·8	4·7	50·4	447·4
1959-60 . . .	380·0	47·0	10·5	72·5	510·0
1960-61 . . .	372·0	58·0	21·0	99·0	550·0

Imports.—Due to the reasons indicated above, substantial foreign exchange had to be expended on imports of refractories during the last five years. By and large these imports were of special types of refractories. However, there was a definite fall in the imports as shown below:

	Value of Imports (Rs. lakhs)	Estimated quantity on the basis of Rs. 800 per ton average (tons)
1957	370·6	46,250
1958	331·5	41,250
1959	330·0	41,250
1960	260·0	32,500

The import statistics given above are exclusive of supplies procured along with capital goods for the steel development programmes. On the basis of imports and indigenous production, it would seem that the consumption in the last year of the Second Plan was at the level of about 6·5 lakh tons; the low off-take as compared to the Plan estimates is apparently due to (a) delays in the commissioning of steel plants and the resultant slackness in the operational demands, (b) lower requirements of refractories conforming to more rigid specifications obtaining in foreign countries, while the estimates of requirements of 8 lakh tons in the Second Plan were based on I. S. I. specifications in vogue then, and (c) the shortfall in the demands under cement industry.

Investment and labour.—The total investment required during the Second Plan period to achieve a capacity target of 10 lakh tons was estimated at Rs. 9 crores. The actual investment is estimated to have been of the same order and the foreign exchange portions thereof, Rs. 4 crores.

The industry provided additional employment to about 6,000 persons. by the end of the Second Plan period.

Ancillary developments.—Taking cognizance of a number of specifications in vogue for imported bricks used in the construction of steel plants, the Ministry of Commerce and Industry have taken up the formulation of common standards for steel plant refractories through the Indian Standards Institution.

A Refractory Panel has been set up in 1959 for fostering the development on a rational basis and giving thought to the special problems relating to specifications, production, planning, managment and technical man power. The Panel has set up three Sub-Committees, one each dealing with raw materials, production techniques and man power problems. Proposals were initiated for deputing a productivity team on refractories for studying the modern techniques of production in countries like U.K., West Germany and U.S.A. Also, with a view to encouraging entrepreneurs' interest in this field, a public notice was issued by the Government in March 1960 and licensing procedure relaxed to the extent of freely licensing the capacity for producing refractories required by the steel plants.

Problems of the industry.—The step up in production achieved in the last five years involved a fairly heavy draft on the primary mineral raw materials. The perspective of future requirements for enabling this industry to keep pace with the demands of the steel industry underlines the urgency of attention to survey and indigenous development of the diverse raw materials. With the increased demand for fireclays, particularly of high alumina clay, the industry has experienced shortages of these raw materials from existing sources of supply. In connection with the prospecting and development of new deposits, important questions for consideration are how best to curtail delays in the grant of mineral concessions and the weightage, if any, to be given to the proposals from the manufacturers of refractories over those of other applicants. In line with the proposal for a switchover of steel

plants to all basic roofs, an entirely new situation is foreseen in respect of indigenous demand for chromite and magnesite in refractories manufacture. Adjustment of plans for the manufacture of refractories in keeping with the changing pattern of demand from the steel plants has recently emerged as a major problem facing this industry. In the ultimate analysis, the phasing of the change-over to all-basic roofs would call for an assessment of likely availability of chromite and magnesite from indigenous sources. The alternative basis would be the manufacture of all-basic refractories with imported raw materials in preference to imported refractories if there is a balance of advantage in such an arrangement and in the event of the change-over of the steel industry to these new linings being regarded as of high priority and urgency. Early decisions are called for on all these aspects of outstanding studies in connection with detailed planning of developments over the next five years.

The industry has been concerned about the shortage in the supplies of quality bauxite for the manufacture of high alumina refractories and of sillimanite. Both these raw materials are mined in areas far removed from the existing locations of the refractories industry, *e.g.* bauxite in Saurashtra and sillimanite in Assam. The problems of long haulage and exports of these minerals are factors leading to high cost and short supplies for this industry.

The refractories industry depends on coal for its fuel requirements. The recent downgrading of coal supplies had led to operational difficulties affecting quality and output specially in the case of units equipped with chamber kilns. Modifications of kilns and firing practices to maintain the proper heat are not considered feasible, under several units in the short term. A review of the problems and their implications has been undertaken by the Panel. In view of the importance of this industry, all assistance possible would have to be given to it to help the maintenance and expansion of production.

II. Programme of Development in the Third Plan:

Estimated requirements.—As already pointed out, the growth of the refractories industry has to be closely related to developments proposed under iron and steel industry which is its largest customer. The demand for refractories under iron and steel arises from operational needs as well as for constructional purposes in building up new capacity. The demand pattern will be linked with the lining material proposed for adoption in the iron and steel plants *e.g.* silica roof or all-basic roof practice. Though the silica roof practice has been in vogue so far, it is envisaged that the basic roof practice will be increasingly adopted under the iron and steel industry on account of the benefits of high productivity. While the Panel had earlier estimated the requirements of refractories based both on silica roof practice and basic practice, the Plan targets were fixed on the basis of the requirements for the silica roof practice, for a clear picture of the programme of the industry's change-over to basic roof was not available.

On the basic of the norms adopted in the Second Plan the operational demand for the iron and steel industry for refractories has been estimated *vis-a-vis* the phasing of production of iron and steel as indicated below :

	Steel Finished (million tons)	Steel Ingots (million tons)	Pig iron for sale (million tons)	Estimated operational demand ('000 tons)
1961-62	3·5	4·7	1·0	420
1962-63	4·0	5·3	1·0	450
1963-64	4·3	5·7	1.0	475
1964-65	5·5	7·3	1·2	615
1965-66	6·8	9·1	1·5	770

For a production equivalent to the capacity figure of 10 million tons of steel ingots envisaged for the Third Plan, the operational demand for refractories would aggregate to about 860,000 tons. The overall supply of refractories for steel industry by the end of the Third Plan has to keep in view the operational demand at the level of the full iron and steel capacity as well as the constructional demand that would be generated by the average rate of expansion of the steel industry in the Fourth Plan period. Visualising this rate at 1·5 million tons of new capacity every year, the constructional demand of the iron and steel industry from the first year of the Fourth Plan will be about 140,000 to 150,000 tons per annum. The combined demand for operational and constructional requirements of refractories will thus be about 1·0 million tons beginning from 1966-67.

As regards the demand for refractories from other consumer industries *e.g.* cement, foundries, glass, ceramics, chemicals and merchant ovens for hard and soft coke for the market, in conformity with the broad practice generally adopted, it has been taken at 50 per cent of the requirements of the steel sector. The overall requirements of refractories by 1965-66 are thus expected to work out to about 1·5 million tons.

Target of capacity.—The level of production for refractories in the last year of the Second Plan corresponds to the utilisation of the installed capacity at about 67%. Assuming some improvement over this performance, the utilisation of installed capacity for achieving a production target corresponding to the estimated requirements, has been envisaged at 75 per cent in the last year of the Third Plan. On this basis, the capacity target for refractories by 1965-66 has been visualised at 2 million tons.

Some changes in regard to capacity and production targets are expected to be required depending upon the tempo of switchover to basic roof practice in the operation of the steel plants. A review of the capacity may

have to be undertaken in 1962 as soon as the exact practice proposed to be followed by the steel plants has been settled. In this context a more detailed examination of the demand for refractories from other consumer industries would be in order.

Schemes under implementation (*a*) *Private sector.*—A number of schemes designed to increase the capacity of the industry have been licensed and they fall into two categories *viz.* (i) those covered by foreign exchange and (ii) those yet to be covered by foreign exchange. The details of these two categories of schemes are given in Annexure II. It will be seen that out of the total licensed capacity of about 16 lakh tons a capacity of the order of 4·2 lakh tons has been cleared for import of machinery by the end of the Second Plan. On this basis, the firm availability of capacity would be around 13 lakh tons. Assuming, however, that all the schemes licensed so far under the Industries (D&R) Act would be implemented, the capacity of the industry would rise to a level of about 24 lakh tons by the end of the Third Plan. Viewed against the capacity target of 20 lakh tons, there is apparently little room for the creation of additional capacity, especially for the conventional types of refactories.

(*b*) *Public sector.*—A project of the Uttar Pradesh Government with a total annual installed capacity of 34,008 tons of refractories (24,000 tons of fire-bricks, 6,000 tons of silica bricks and 4,008 tons of sillimanite bricks) was licensed in May 1960. The total investment required for this project is estimated at Rs. 85 lakhs which has been provided for in the State's Third Plan. The foreign exchange portion of this expenditure is placed at about Rs. 27 lakhs. This project will form part of the expansion programme envisaged under the Government Cement Factory, Churk. The preliminary work connected with this scheme will be taken up during the current year and the expectation is that it would go into production by the end of the Third Plan.

Further, the Central Government have under consideration the setting up of a basic refractories plant at Bhilai with U.S.S.R. collaboration for the manufacture of basic bricks and special quality bricks mainly for blast furnaces and ladles. The total investment on this project is estimated at Rs. 3 crores, the foreign exchange component thereof is reckoned at Rs. 1·5 crores.

Investment and employment.—The bulk of the investment on schemes involving an additional capacity of about 12 lakh tons will be made during the Third Plan period, although some expenditure will have been incurred during the Second Plan period on schemes which have already been licensed. The total investment required during the Third Plan period is estimated at Rs. 22 crores and the foreign exchange portion thereof at Rs. 10 crores.

The additional employment likely to be created in the industry during the period under reference is placed at about 20,000.

Raw materials.—The industry's annual requirements of raw materials, fuel, electric power etc. by 1965-66 would be roughly as given below :

Item	Indigenous/Imported	Annual requirements of 1965-66 (lakh tons)
Raw materials—		
Fireclay	Indigenous	9·60
Bauxite	Do.	0·96
Sillimanite	Do.	0·10
Kyanite	Do.	0·06
Quart zite	Do.	3·00
China clay	Do.	0·12
Magnesite	Do.	0·20
Chromite	Do.	0·07
Vermiculite	Imported	0·01
Coal (Selected, 'A' grade high volatile)		9·00
Heavy furnace Oil		0·60
Electric power		360 million kwh

Miscellaneous.—The industry will have to take to improved techniques of production to face the increasingly rigid specifications, high temperature requirements, hot load strength, resistance to deformation, higher density and dimensional accuracies. All these have direct bearing not only on the quality of the end-products but also on the production economics. These developments have another far-reaching implication in the sense that the old conception of putting up refractory units on small capacity basis has to be discarded in favour of larger and modern plants.

As regards size, it is considered that in the context of the conditions currently obtaining in India, the refractory factories around the steel plants should preferably have capacities of 30,000 tons per annum or multiples thereof.

The following table summarises the development programme of the industry :

	(lakh tons)	
	1960-61	1965-66
Capacity	8·2	20
Production	5·5	15

ANNEXURE I

Additional Capacity that went into production between 1st April 1956 and 1st April 1961

	State	Capacity
New Units		
M/s Bharat Mining Corporation	Bihar	6,000
M/s Kusunda Refractories	Do.	6,000
M/s Harry Refractories	Do.	6,000
M/s B. N. Mondal	Do.	7,200
M/s Hindustan Refractories	West Bengal	10,200
M/s Balsukh Ceramics	Do.	22,200
M/s Hind Refractories	Do.	12,000
M/s Orissa Cements	Orissa	88,000
M/s Belpahar Refractories	Do.	66,960
M s Belpahar Salem	Madras	24,000
M/s Dalmia, Magnesite	Do.	36,000
M/s Tube Suppliers	Do.	3,000
M/s New Firebricks	Madhya Pradesh	4,800
M/s A. N. Bhaskar	Punjab	2,400
M/s Bhopal Mining	Rajasthan	1,200
M/s Dig Vijay Tiles and Potteries	Gujcrat	7,200
	TOTAL	303,160
Substantial Expansions		
M/s Kumardhubhi Fireclay & Silica Works	Bihar	26,400
M/s Jauhar Firebricks and Refractory Works	Do.	6,000
M/s Jharia Firebricks & Pottery Works	Do.	2,400
M/s Bihar Firebricks & Pottery Works	Do.	6,000
M/s Tata Iron & Steel	Do.	4,320
M/s Bengal Bihar Firebricks & Pottery Works	Do.	4,400
M/s Bharat Firebricks & Pottery Works	Do.	6,000
M/s A.C.C., Katni	Madhya Pradesh	11,640
M/s Perfect Potteries	Do.	5,400
	TOTAL	72,560
	GRAND TOTAL	375,720

ANNEXURE II

Additional capacity licensed under the Industries Act

Name of the party	State	Annual capacity (in tons)
(a) Schemes covered by foreign exchange and those not requiring any appreciable amount of foreign exchange		
New Units		
M/s Ray Refractories	Bihar	12,000
M/s Harish Tara Refractories	Do.	12,000
M/s Assam Sillimanite	Do.	46,000
M/s Asian Refractories	Do.	24,000
M/s Asian Refractories	Do.	6,000
M/s Shree Gupteshwar	Do.	8,400
M/s India Firebricks & Insulation	Do.	72,000
M/s India Refractories	West Bengal	36,000
M/s Universal Refractories	M.P.	12,000
M/s Premier Refractories	Do.	12,000
U.P. Govt. Cement Factory	U.P.	2,400
M/s Shri Hari Dutt Balawali	Do.	4,260
M/s Burn & Co.	Madras	12,000
Expansions		
M/s Jauhar Firebricks	Bihar	14,200
M/s Jharia Firebricks	Do.	22,040
M/s Bihar Firebricks & Potteries	Do.	30,250
M/s Bengal Bihar Firebricks	Do.	9,000
M/s Kumardhubi	Do.	4,080
M/s Kumardhubi	Do.	4,080
M/s Kumardhubi	Do.	20,040
M/s Burn & Co., Calcutta	West Bengal	7,200
M/s Mysore Stoneware Pipes	Mysore	1,800
M/s Orissa Industries	Orissa	24,000
M/s Ishwar Industries	Delhi	10,200
M/s Associated Cement Co.	M.P.	12,360
	TOTAL OF (a)	418,310

Name of the Party	State	Annual capacity (in tons)
(b) Schemes no. covered by foreign exchange—		
New Units		
M/s New Bharat Refractories	Bihar	24,000
M/s Damodar Valley Refractories	Do.	30,000
M/s Ralyaram Melaram.	Do.	6,000
M/s Aryavarta Industries.	Do.	60,000
M/s Asiatic Oxygen & Acetylene	Do.	80,400
M/s Sri Jogmohan Modi.	Do.	24,000
M/s Hindustan Investment	Do.	36,000
M/s Surrendera (overseas)	W. Bengal	18,000
M/s Asansol Refractories	Do.	48,000
M/s Sonajuli Tea Industries	Do.	15,000
M/s India Silica Magnesite	Do.	25,000
M/s Burn & Co.	M.P.	18,000
M/s Rajendra Kumar Somani	Do.	60,000
M/s Sh. Sohan Lall, N. Delhi	Do.	60,000
M/s Amar General Refractories	Do.	15,000
M/s Jain & Rai	Do.	24,000
M/s Surajmal Mehta	Do.	60,000
M/s Birla Jute	Do.	36,000
M/s Ishwar Industries	Rajasthan	24,000
M/s Agarwal & Agarwal	Assam	7,200
M/s Assam Sillimanite	Do.	12,900
M/s Govt. Refractories, Churk	U.P.	34,008
M/s Bihar Orissa Mining Corpn.	Do.	48,000
M/s Hind Traders	Gujerat	1,920
M/s Orissa Firebricks and Potteries	Orissa	9,000
M/s Himalaya Marble & Tiles	Do.	30,000
M/s Nandram Hunrat Ram	Do.	36,000
M/s Salem Magnesite	Madras	24,000
M/s Dalmia Magnesite Corpn.	Do.	36,000
Expansions		
M/s Reliance	Bihar	18,000
M/s Reliance	Do.	102,000
M/s Bharat Firebricks & Potteries	Do.	18,000
M/s Bharat Mining Corpn.	Do.	18,000
M/s Iswar Industries	M.P.	21,600
M/s Orissa Industries Barang	Orissa	24,000
M/s Orissa Cement	Do.	31,000
M/s Belpahar Refractories	Do.	15,000
TOTAL OF (b)		1,150,028
GRAND TOTAL OF (a) & (b		1,568,338

58. ELECTRIC PORCELAIN INSULATORS, H.T. & L.T.

Porcelain is a ceramic product obtained by the high temperature vitrification of clay, finely ground felspar and silica. High grade electric porcelain of the proper chemical composition and free from holes and cooling stresses is the recognised di-electric for insulating high voltage lines. The perfection of production control and testing which has been achieved in recent years, has brought the product to a standard of uniformity that was impossible in the early days. It is used in various forms in power equipment manufacture, for example, transformers and switchgears and in the transmission and distribution systems linked with power generation and consumption. Porcelain is used largely in the form of insulators of different types and shapes and so as to suit the specific purpose in view.

Insulators used on transmission lines are classified broadly into two categories, *viz.*, suspension type and pin type. According to modern practice, suspension type insulators are used for voltages above 33 kv and pin type for voltages of 33 kv and below. Insulators for other uses are post type, strain type, outdoor apparatus type, bushings etc.

1. Review of Progress in the Second Plan :

Targets.—No targets were fixed for the capacity and the production of high tension (H.T.) and low tension (L.T.) insulators in the Second Plan. Its growth was planned on the basis of an *ad hoc* study of the future requirements. The industrial programmes in the public sector envisaged the completion of the electric porcelain insulators project of the Government Porcelain Factory, Bangalore and the establishment of a second factory in Bihar by the State Government.

Capacity & Production.—At the end of 1955, there were six units in existence for the manuafcture of H. T. electric porcelain insulators and nine units for L. T. insulators and the yearly production was approximately 300 tons and 2,000 tons respectively. The production of H.T. insulators was intermittent and confined mostly to the suspension type. During the Second Plan period, three new units, *viz.*, M/s. B. C. Nawn & Co., M/s. Bharat Potteries and the Government Porcelain Factory, Bangalore commenced production of both the types of insulators and the unit of M/s. Bengal Potteries Ltd., Calcutta was expanded. M/s. Dalmia Cement Ltd. and the Kerala Government Ceramics, Kundara, also commenced production of L.T. insulators. Some of the units which were in existence even in the First Plan period, did not show any production of insulators during 1956-61. At the end of 1960, six units registered the production of H.T. insulators and 13 units were engaged in the production of L.T. insulators. The installed capacity of the

former was 4,652 tons and of the latter, 7,933 tons per year at the commencement of the Third Plan. An indication of the progress of production during the Second Plan period is given by the data below:

(in tons)

	H.T. Insulators	L.T. Insulators
1956	347	2,282
1957	647	2,507
1958	1,715	2,960
1959	2,412	3,330
1960	2,334	3,916

Government Porcelain Factory, Bangalore.—The electric porcelain project of the Government porcelain Factory, Bangalore was commissioned in 1957. It has taken nearly three years to diversify the production and expand it from the small beginning made in 1957. The procurement of malleable iron castings from indigenous sources was a serious problem confronted by the factory. As compared to its planned installed capacity of 2,500 tons per year, the production recorded was as follows:

(tons)

	H.T.	L.T.
1956	30·45	14·55
1957	211·60	50·85
1958	1,180·15	136·15
1959	1,719·70	132·80
1960	1,161·15	75·25

Imports.—The imports of porcelain insulators of both H.T. and L.T. types rose to Rs. 156·6 lakhs in 1958, and showed a downward trend during the later years of the Second Plan period as is indicated below:

	Value (Rs. lakhs)
1957	100·2
1958	156·6
1959	123·8
1960	107·9

Exports.—The following table shows the yearwise value of exports of electric porcelain insulators during past four years:

	value (Rs. lakhs)
1957	0.40
1958	0·12
1959	0·75
1960	0.19

II. Programme of Development in the Third Plan:

Estimated requirements.—The requirement of electric porcelain insulators are related to the tempo of construction of transmission and distribution schemes, the production of electrical equipments like transformers and switchgears, and to the requirements of post and telegraph department which uses mainly L. T. insulators. The extent of transmission and distribution of electric power depends on a number of factors such as the location of power stations with respect to load centres, types of industries and areas to be served, pattern of industrial consumption and rural electrification programmes. The number of insulators required per mile of transmission lines also varies depending upon the types of transmission voltage, number of transmission circuits etc. In the absence of precise information on these aspects, the actual requirements have to be forecast in somewhat general terms.

During the Second Plan period, the additional generating capacity installed averaged about 0·45 million k.w. per annum and the corresponding yearly requirements for H.T. insulators have approximately been of the order of 2·2 million numbers. It is now proposed to step up generating capacity to 1.4 million k.w. per year on an average during the Third Plan. The requirements for insulators will accordingly go up and can be estimated at about 6·6 million number per year. It is generally observed that 500 disc insulators or 700 pin type insulators are equivalent to one ton of output of insulators. On the basis of the relationship between the numbers and weight, the estimated demand for H.T. insulators would go up to about 10,000 tons per annum in the Third Plan.

In the case of an important item like H.T. insulators, it is also necessary to take a longer term view of requirements into account as well as the picture of the annual growth of power generation rather than the annual average for the quinquennium. On the basis of the phasing of electric power generation in the Third Five-Year Plan, it will be noted that the new generating capacity added to the power system in 1965-66 will be about 2·5 million kw. If the requirements of H.T. insulators were related to this figure instead of that of an annual rate of growth of power, the offtake in 1965-66 would be about 18,000 tons. Similarly, it is now envisaged that the expansion of power supply facilities in the Fourth Plan period would grow at an average annual rate of 2·0 million kw. Linked with this perspective, the average annual demand for H.T. insulators in the Fourth Plan period would be about 14,000 tons.

On balance of all considerations it is felt that a demand estimate of 14,000 tons per year should be kept in view to guide the developments in the field of H. T. Insulators.

As regards L. T. insulators, the requirements stem mainly from the programme of rural electrification, commercial and public lighting and expansion of telegraph and telephone connection facilities. The rate of consumption during the Second Plan period varied roughly from 2,200 tons to 4,000 tons per annum. It is envisaged that the requirements would go up by about 50 per cent over the levels which obtained during 1956-61. Thus the demand in 1965-66 for L. T. insulators is expected to average at about 6,000 tons per year.

In planning for production, account has also been taken of export possibilities and requirements of which have been placed at 2,000 tons each of H. T. and L. T. insulators by the end of 1965-66.

Targets of Capacity & Production.—To meet the domestic and export requirements for H. T. and L. T. electric porcelain insulators, the capacity and production targets have been fixed as follows :

(Figure in tons)

	Capacity	Production
H.T. insulators	20,000	16,000
L.T. insulators	10,000	8,000

Schemes under implementation.—The following projects for the manufacture of H. T. and L. T. insulators, for which the import license has been granted, were under implementation at the end of Second Plan :

(Figure in tons)

	H.T. insulators	L.T. insulator
M/s Seshasayee Industries, Neiveli	1,080	720
Government Insulator Factory Ranchi	2,000	..
M/s Hindustan General Electric Corporation, Calcutta	1,800	1,200
M/s Jai Shree Textiles Ltd., Rishra, Calcutta	2,000	..
M/s Bengal Potteries, West Bengal	2,000	2,400

Requirements of additional capacity vis-a-vis targets.—Though the capacity licensed at present is very much in excess of the targets set for the Third Plan, the additional capacity required to meet the targets, would be comparatively smaller after the completion of above schemes. So, considering the shortage of foreign exchange, further granting of import licences during the next two or three years should be selective and licencees who have succeeded in securing the most favourable terms for import of machinery should be preferred.

Developments in the Public Sector.—At the end of Second Plan period two units were in existance in the public sector for the manufacture of H.T. and L. T. insulators. One at the Govt. Porcelain Factory, Bangalore, producing both H.T. and L.T. insulators, and the other is at Kerala Govt. Ceramics, Kundara, producing only L.T. insulators. Their combined annual installed capacity at the end of Second Plan was 2,520 tons of H.T. insulators and 720 tons of L.T. insulators. Govt. of Bihar are also expected to commence the manufacture of H.T. insulators at Ranchi towards the end of the first year of the Third Plan, with annual installed capacity of 200 tons of H.T. insulators. With the completion of the Ranchi factory the annual installed capacity in public sector would become 5,240 tons of electric porcelain insulators, which will be about 40% of the total installed capacity in the country.

Raw Materials required.—Raw materials for the electric porcelain industry fall under two categories, namely, plastic materials like china clay, ball clay and non-plastic materials like quartz, feslpar, lime, malleable castings and others. The quantities of raw materials, fuels and power required for a production of 24,000 tons of H.T. and L.T. insulators are approximately estimated as follows :

(Figure in tons)

	Raw material required for 1,000 tons of insulators	Total requirements for 24,000 tons of insulators
China clay	750	18,000
Ball & Plastic clays	200	4,800
Felspar	375	9,000
Quartz	500	12,000
Gypsum	375	9,000
Chemicals for glass etc.	100	2,400
Malleable castings	300	7,200
Fuel (coal)	1,700	40,800
Power	450,000 k.w.h.	10·8 million k.w.h.
Water	5 million gals.	120 million gals.

All the raw materials except ball clay are available in the country in sufficient quantities. Ball clay as such is not indigenously available but there are a few deposits of good plastic fine clay in Saurashtra and Bihar which have been used as a substitute for ball clay. The preliminary investigations have shown that for most purposes these clays are suitable. Only in special cases of H.T. insulators ball clay shall have to be imported.

Investment.—An investment of Rs. 3 crores including Rs. 2·2 crores on foreign exchange is likely to be made on electric porcelain insulator industry during Third Plan period.

General Recommendations.—The installation of testing facilities are of crucial importance for ensuring production of quality products. Due attention should be given to this aspect in building up the production facilities for H.T. insulators in particular.

59. GLASS

1. Review of Progress in the Second Plan:

Targets.—The domestic consumption of glass and glassware (excluding bangles) was estimated by the Planning Commission at 200,000 tons in the final year of the Second Five Year Plan. Imports and exports were expected to be of the same order *viz.*, worth Rs. 50 lakhs, in 1960-61. The production target in the Second Plan was, therefore, fixed at 200,000 tons. On the completion of the schemes which were under implementation at the end of the First Plan, the capacity of the industry was expected to be raised to about 338,000 tons per annum.

Capacity and production.—At the commencement of the Second Plan there were 109 glass factories in India with an annual installed capacity of about 291,000 tons. In addition, there were 22 factories with a capacity of about 23,000 tons which were, more or less, permanently closed. By March 1961 the number of factories had gone up to 148 and the installed capacity to 444,000 tons, which includes the 22 closed factories referred to above. Recently, the Development Wing of the Ministry of Commerce & Industry have gone in detail into the question of the effective capacity of the glass industry. They have reached the conclusion that 51 factories with a capacity of about 61,000 tons which have been lying idle for over 3 years may be scrapped for the purpose of planning the future development of the glass industry as there was little likelihood of these units ever coming into production again. The State-wise distribution of the remaining 97 factories representing a capacity of about 383,000 tons is given below :

State	Number of factories	Annual capacity (tons)
Uttar Pradesh	28	83,000
West Bengal	24	110,400
Maharashtra	22	57,900
Madras	6	11,100
Bihar	4	60,700
Gujarat	2	27,900
Orissa	2	13,200
Punjab	2	5,800
Delhi	2	1,800
Rajasthan	1	4,800
Kerala	1	3,600
Andhra Pradesh	1	1,800
Madhya Pradesh	1	700
Mysore	1	500
TOTAL	97	383,200

The item-wise break-up of this capacity is as follows:

Item	Annual capacity (in tons)
Bottles and vials	174,100
Table and pressedware	74,500
Sheet glass	61,800
Lampware	42,200
Scientific glassware	14,000
Thermos flasks	3,480
Shells for electric lamps	2,860
Miscellaneous glassware	10,400
TOTAL	383,340

A list of schemes (new units as well as substantial expansions of existing units) which were completed during the Second Plan period is given in the Appendix.

The production of different types of glass and glassware from 1955 onward is given below :

	1955	1956	1957	1958	1959	1960
Bottles and vials	55,270	62,410	70,240	82,530	110,570	107,740
Table and pressedware	25,460	28,2[illegible]	31,770	38,970	36,580	37,430
Sheet glass	20,540	28,850	29,010	37,490	41,760	43,740
Lampware	16,690	19,870	17,890	19,590	18,800	18,250
Scientific glassware	2,500	3,360	3,120	4,170	5,210	4,870
Thermos flasks	310	330	300	490	810	910
Shells for lamps	1,160	1,520	1,940	1,790	2,110	2,440
Misc. glassware	2,270	3,030	3,640	5,790	6,460	9,360
TOTAL	124,200	147,590	157,910	190,820	222,300	224,740

As will be seen from the figures of production tabulated above, the output of glass and glassware had shown a steady rise and exceeded even in 1959 the production target of 200,000 tons set for the last year of the Plan. The production in 1960 was, however, only slightly higher than in the previous year.

Manufacture of new items.—Coloured sheet glass, safety glass, glass wool and fibre glass, glass building blocks, glass syringes, synthetic stones and glass chatons are some of the new items whose manufacture was undertaken for the first time in the country during the Second Plan period. The

pilot plant project to experiment with the production of optical glass undertaken in the Central Glass and Ceramic Research Institute, Calcutta, has shown good results. The Institute is expected to start the manufacture of optical glass during the Third Plan period with a view to meeting the demand for this product in the country. The manufacture of ophthalmic glass will be undertaken in a public sector project to be located at Durgapur and financed out of the credit of 500 million roubles offered by the U.S.S.R. Government. Its project report is at present under preparation by the Russian consultants. The total cost of the project is tentatively estimated at Rs. 2·6 crores of which the foreign exchange component would be about Rs. 2·0 crores.

Imports and exports.—The imports and exports of glass and glassware from 1956 onwards have been as follows :

(Rs. lakhs)

	Imports	Exports
1956	171·40	26·10
1957	167·56	22·65
1958	57·96	20·34
1959	82·74	24·72
1960	120·82	24·50

Import/export figures in quantities are not available for all the items. As is evident from the above figures of imports, these had gone down considerably during 1958 and 1959. This was due to severe restrictions which were imposed on all imports, particularly of consumer goods, from 1957 onwards on balance of payments considerations. The spurt in imports during 1960 is mainly due to barter agreements with the rupee payment countries for items like laboratory glassware and hollow building blocks, which are either in short supply or have no indigenous angle.

As for exports, the level was visualised at Rs. 50 lakhs in the Plan which would offset imports of corresponding value. The export target has not been achieved mainly due to the high cost of production of glass and glassware in the country.

Consumption.—On the basis of production plus imports minus exports the internal demand for glass and glassware from 1955-56 onwards may be estimated as follows :

('000 tons)

1955-56	136
1956-57	168
1957-58	181
1958-59	198
1959-60	230
1960-61	250

The demand for glass and glassware has developed at a much faster rate than was envisaged in the Second Plan. This was placed at 200,900 tons by 1960-61 as against 135,500 tons in 1955-56 representing an increase of 50%. This order of increase was nearly achieved in 1958-59. The item-wise break-up of the estimated demand of 250,000 tons in 1960-61 is given below :

	tons
Bottles and vials	110,000
Table and pressedware	40,000
Sheet glass including plate glass etc.	60,000
Lampware	20,000
Scientific glassware	6,500
Thermos flasks	1,500
Shells for lamps	2,000
Misc. glassware	10,000
TOTAL	250,000

Investment.—It is estimated that a capital investment of about Rs. 3·5 crores was made on new units and substantial expansions in the glass industry during the Second Plan period. Its foreign exchange component is estimated at Rs. 1·25 crores.

Mechanisation of the industry.—During the Second Plan period the capacity of the mechanised sector of the glass industry has risen from about 85,000 tons to 150,000 tons. The production in this sector has gone up from about 45,000 tons to 90,000 tons. Recently, there has been a major shift in demand in favour of bottles and other containers made on automatic machines as a result of mechanisation in the consuming industries like drugs, pharmaceuticals and cosmetics.

Technical survey of the industry.—A Technical survey of the industry was undertaken during 1956-57 with the help of experts from the Technical Cooperation Mission of the U.S.A. and United Nations Technical Assistance Board. The survey covered a study of requirements in various fields such as sheet glass, glass tank furnaces, annealing lehrs, moulds, glass-working machinery and composition of glass batches in 60 factories spread out all over the country. The industry has benefited substantially by the advice given by the overseas experts.

Tariff protection.—The Tariff Commission reviewed the protection granted to the sheet glass industry in 1957 and 1960. The protection has been extended to the end of 1962. The rate of protective duty continues at 70% *ad valorem*.

II. Programme of Development in the Third Plan :

Estimated requirements.—There was a rapid increase in the domestic consumption of glass and glassware during the Second Plan period and the average annual rate of increase has worked out to about 17%. It is felt that the rate of increase in consumption during the Third Plan period may not be as much as 17% due to the following reasons :

(a) The shortage of tinplate during the Second Plan period which provided a stimulus for a wider use of glass containers is expected to be relieved with the supplies expected from the Rourkela steel plant in the near future.

(b) In the coming years glass will have to contend with the claims of substitute materials like plastics in some sectors of the packaging field. Plastics are also a potential rival to glass in the pressedware field.

(c) The availability of bottles for reuse will assume larger dimensions as higher levels of production are achieved.

O ..ance of all considerations it is estimated that the requirements of glass and glassware in 1965-66 would be of the order of 440,000 tons inclusive of export requirements of about 15,000 tons. This would give an average annual increase of a little over 15% during the Third Plan period. An item-wise break-up of this demand among different categories of glass and glassware is broadly visualised as follows :

	(tons)
Bottles and vials	200,000
Table and pressedware	65,000
Sheet glass, plate glass etc.	100,000
Lampware	30,000
Scientific glassware	15,000
Thermos flasks	2,700
Shells for electric lamps	3,300
Miscellaneous glassware	24,000
TOTAL	440,000

Targets of capacity and production.—In view of the estimates made in the foregoing paragraph and the assumption that the demand would be met almost entirely from indigenous sources, the production target for glass and glassware at the end of the Third Plan has been fixed at 440,000 tons. On the basis of 80% utilisation of installed capacity in the case of sheet glass and 70% in other categories, the capacity target is visualised at about 615,000 tons. Planning on this basis would provide adequate buffer capacity to boost up production further, if required.

The break-up of the capacity target in terms of different broad categories of glassware is visualised as follows :

	Break-up of the capacity target (tons)
Bottles and vials	290,000
Table and pressedware	90,000
Sheet glass including plate glass etc.	125,000
Lampware	44,000
Scientific glassware	22,000
Thermos flasks	4,000
Shells for lamps	5,000
Miscellaneous glassware	35,000
TOTAL	615,000

Additional capacity required.—In addition to the existing capacity of 383,000 tons, a capacity of about 316,000 tons comprising of 30 new units and 18 substantial expansions has been approved and is at various stages of implementation. Schemes covered by import licences for machinery account for a capacity of about 103,000 tons. For expansion of the industry upto the capacity target, the requirement of additional foreign exchange on capital account is estimated at Rs. 2·0 crores.

Against the background of the capacity target of 615,000 tons, there does not appear to be need for licensing additional capacity under this industry except for plate glass for which no scheme has yet been approved, unless some of the schemes cleared for implementation fall by the wayside. In the field of bottles and vials, table and pressedware, scientific glassware and miscellaneous glassware, the production capacities are capable of some interchangeability. This factor provides some flexibilty for production planning under this industry in response to changing patterns of demand. A study of the potential currently available for such flexibility should be undertaken before consideration is given for fresh licensing under this industry during the period of the Third Plan. This study also assumes importance in the context of the right foreign exchange position *vis-a-vis* the pressure of demand for capital goods from different industries.

Investment and employment.—For achieving the targetted capacity of 615,000 tons, a capital investment of about Rs. 11·0 crores will be required to be made during the Third Plan period. Its foreign exchange component is estimated at Rs. 4·5 crores. These estimates also include the requirements of the ophthalmic glass plant to be established in the public sector.

The additional employment expected from the development of the glass industry in the Third Five Year Plan is estimated at about 25,000.

Requirements of raw materials.—To achieve a production of 440,000 tons of glass and glassware in 1965-66, the industry will require the following quantities of the principal raw materials :

	(tons)
Glass sand	372,000
Soda ash	134,000
Lime	55,000
Saltpetre	9,300
Borax	7,500
Arsenic	1,100
Coal	700,000*
Refractories	12,700

* All fuels have been calculated in terms of coal. However, there is a noticeable trend towards use of furnace oil instead of coal. The estimate of current and 1965-66 consumption of fuel oil is 25,000 tons and 55,000 tons respectively.

Soda ash, borax and arsenic are at present imported. Supplies of heavy soda ash, the variety required by the glass industry, are expected to become wholly indigenous by the end of the Third Plan period. More extensive washing of glass sand is visualised in the coming years.

The following table summarises the development programme for the glass industry in the Third Five Year Plan :

	1960-61	1965-66
Capacity ('000 tons)	383	615
Production ('000 tons)	225	440

APPENDIX

New Units & Substantial Expansions which were completed during the Second Plan period

	Annual Capacity (in tons)
A. New Units	
M/s Modern Moulders, Calcutta	1,500
M/s Mayurbhanj Glass Works, Mayurbhanj (Orissa)	1,200
M/s C.B. Glass Works, Etmadpur (U.P.)	2,400
M/s Hyderabad National Industries, Hyderabad	1,500
M/s J. G. Glass Industries, Bombay	1,440
M/s Asoka Glass Works, Firozabad (U.P.)	1,800
M/s Eagle Vacuum Bottle Mfg. Co., Bombay	172
M/s Bansal Electrical Industries, Firozabad (U.P.)	240
M/s B. K. Shaw Industries, Calcutta	1,200
M/s Shimada Glass Works, Madras	1,200
M/s Chandra Bhan Anil Kumar, Firozabad (U.P.)	1,800
M/s Narayan Glass Factory, Firozabad (U.P.)	1,800
M/s Ruby Novelties Glass House, Firozabad (U.P.)	1,080
M/s Shyam Glass Works, Sasni (U.P.)	720
M/s Punj and Sons, Jamshedpur	1,500
M/s Krishna Glass & Silicate Works (Bombay unit)	6,504
M/s Chatons Private Ltd., Calcutta	180
B. Substantial Expansions	
M/s Vitrum Glass Products, Bombay	1,356
M/s Hindusthan Pilkington Glass Works, Asanol	3,960
M/s Calcutta Glass & Silicate Works, Calcutta	1,248
M/s Kohinoor Glass Factory, Hyderabad	3,180
M/s Industrial and Engineering Apparatus Co., Bombay	1,464
M/s Star Glass Works, Bombay	1,680
M/s Ashoka Glass Works, Calcutta	4,200
M/s Metro Glass Works, Calcutta	3,600
M/s New Indian Glass Works, Calcutta	960
M/s Shiva Glass Works, Calcutta	1,620
M/s Shree Govindo Glass Works, Calcutta	3,000
M/s Naini Glass Works, Allahabad	1,380
M/s Paliwal Glass Works, Shikohabad (U.P.)	2,520

	Annual Capacity (in tons)
M/s Vibhuti Glass Works, Banaras	8,400
M/s Alembic Glass Industries, Baroda	16,140
M/s Mahalakshmi Glass Works, Bombay	4,500
M/s Patanwala Glass Works, Bombay	3,300
M/s Hindustan National Glass Mfg. Co., Calcutta	13,140
M/s Dholpur Glass Works, Dholpur (Rajasthan)	3,960
M/s Shree Durga Glass Works, Barang (Orissa)	8,400
M/s Ajit G ass Works, Bombay	1,800
M/s Travancore-Ogale Glass Mfg. Co., Alwaye (Kerala)	1,800
M/s India Electrical Glass Works, Firozabad (U.P.)	2,160
M/s U. P. Glass Works, Bahjoi (U.P.)	3,840
M/s Seraikella Glass Works, Kandra (Bihar)	3,600
M/s Krishna Glass and Silicate Works, Calcutta	2,160

60. PETROLEUM REFINING

At the commencement of the First Plan, practically the entire demand of the country for petroleum products was met by imports, as the output of M/s. Assam Oil Company's refinery at Digboi amounted hardly to about 5% of the requirements. The First Plan provided for the establishment of three refineries based on imported crude oil and two of them, *viz.*, those of M/s. Standard Vacuum Oil Company and M/s. Burmah-Shell were commissioned in August, 1954 and January, 1955 respectively. The third refinery at Vishakhapatnam belonging to the Caltex organisation went on stream in April, 1957. With the commissioning of the three refineries, the installed capacity for petroleum refining, increased by the end of 1957 to 4·3 million tons in terms of crude throughput as given below:

	(million tons)
Assam Oil Company	0·40
Standard-Vacuum Oil Company	1·20
Burmah-Shell	2·00
Caltex	0·68
TOTAL	4·28 or 4·3

Having regard to the rapidly expanding requirements of petroleum products, the establishment of additional facilities for petroleum products was *prima facie* necessary and desirable; but this has, however, to be closely linked with the results of exploration in progress for locating indigenous sources of petroleum in adequate quantities. In the context of the existing uncertainty in early 1956 about fresh oil resources and their reserves, the Second Plan did not make any specific provision for additional refining capacity.

1. Review of Progress in the Second Plan period:

Capacity.—The intensification of the exploratory and prospecting programme for oil in Nahorkatiya area of Assam by M/s. Assam Oil Company gave promising results and a Rupee Company—the Oil India Limited—in the form of a joint venture of the Burmah-Oil Company, the Assam Oil Company and the Government of India with the Government having one-third share of the equity capital, was established early in 1959 to exploit the oil reserves proved in the area. This company was to develop the oil fields for an annual production of 2·75 million tons of crude oil. Based on the indigenous availability annually of 2·75 million tons of crude oil, the establishment of two refineries in the public sector with a total throughput capacity of the same order was included in the Second Plan towards the end of 1958. The first of these two refineries with a capacity of 0·75 million tons, was to be established at Nunmati (near Gauhati) in Assam. The second unit with a

capacity of 2 million tons was planned to be established at Barauni in Bihar. The refinery at Nunmati, estimated to entail a capital outlay of Rs. 17 crores, was originally envisaged to go on stream in April 1961, but on the basis of the latest appreciation of the construction schedules, it is now expected to be ready for trial runs in November, 1961 and for full-scale operation from April, 1962. Preparatory work on the Barauni refinery which is planned to be constructed and commissioned in two phases was started in the last year of the Second Plan. The first unit of this refinery with a throughput capacity of one millon tons is expected to be ready towards the close of 1962 and the second unit of similar capacity by the middle of 1963.

On the basis of the proposals approved originally, the installed capacity of the three coastal refineries at Bombay and Vishakhapatnam was 3·9 million tons. In view of the difficulties relating to foreign exchange which developed early in the Second Plan, the three new refineries were allowed to expand their throughput capacity. As a result of the expansions carried out at these refineries, the indigenous capacity for refining crude petroleum increased to about 6·0 million tons by the end of the Second Plan period as indicated below:

	(million tons)
Assam Oil Company, Digboi	0·40
Standard-Vacuum Oil Company, Trombay	1·90
Burmah-Shell, Trombay	2·80
Caltex, Vishakhapatnam	0·85
TOTAL	5·95 or 6

In addition, the refineries took up the production of some new items which were not envisaged earlier, *e.g.*, liquified petroleum gas, jute batching oil, pegasol and special boiling point spirits.

Production and imports.—Production of petroleum products increased from 3·80 million tons in 1956 to 5·665 million tons in 1960. With the establishment of indigenous production of pertoleum products, imports came down from 3·7 million tons in 1953 to 3·5 million tons in 1954, when the first of the new refineries went into production. During the Second Plan period, in spite of the steadily increasing demand for petroleum products, imports were substantially lower than before the coming in of the new refineries. They varied between 1·8 million tons and 2·0 million tons per annum.

The value of import of petroleum products was as follows during the Second Plan period :

	Crude petroleum		Refined petroleum products	Total of imports
	'000 tons	(Rs. Crores)	(Rs. Crores)	(Rs. Crores)
1956-57	3,851	31·93	44·27	75·20
1957-58	4,596	39·94	44·47	84·41
1958-59	4,501	38·00	37·60	75·60
1959-60	5,221	40·67	47·15	87·82
1960-61	5,709	39·25	43·12	82·37

The table below gives a break-up of the production and imports of petroleum products during the period 1956 to 1960:

('000 tons)

Products	1956		1957		1958		1959		1960	
	Production	Imports	Production	Imports	Production	Imports	Production	Imports	Production	Imports
1	2	3	4	5	6	7	8	9	10	11
Light distillates—										
Includes Aviation spirit, Motor spirit, Solvent oil, L.P. Gas.	948	114	1,025	131	971	94	933	107	1,023	114
Kerosene—										
Superior Kerosene, Inferior Kerosene, Aviation Turbine fuel.	537	947	608	1,063	632	1,093	723	1,240	916	1,196
Diesel oils—										
H. S. D. L. D. O. M. D. O.	700	327	912	260	1,173	301	1,394	306	1,574	294
Heavy ends—										
Furnace Oil, Low sulphur furnace oil, Hot heavy stock J.B.O.	1,389	80	1,874	82	1,623	74	1,653	66	1,666	131

1	2	3	4	5	6	7	8	9	10	11
Others . . .	65	247	84	251	74	236	85	259	94	247
Bitumen . .	162	128	174	52	223	19	283	6	383	16
TOTAL . .	3,801	1,843	4,377	1,839	4,696	1,817	5,071	1,984	5,665	1,998

Investment.—On the basis of the proposals put forward at the time when the establishment of the three refineries was approved, an overall investment of Rs. 64·6 crores was visualised on them. Inclusive of the gross investment incurred in the plant of the Digboi refinery, the total fixed capital investment in the refining industry during the First Plan period was Rs. 45 crores. The completion of the Caltex refinery in Vishakhapatnam and the additional facilities for increasing throughput and for manufacturing new items in the three refineries are estimated to have led to an investment of an additional Rs. 20·6 crores during the Second Plan period. In addition about Rs. 8 crores are estimated to have been invested by the Government on the construction of the Nunmati and Barauni refineries. Thus, the investment in the oil refining industry at the end of the Second Plan is placed at Rs. 73·6 crores.

Problems of the industry.—The chief feature of the indigenous petroleum industry—this is also common in other countries—is the lack of balance between the pattern of production and the demand for petroleum products particularly in the case of motor spirit which is in surplus and the middle distillates which are in deficit. The rapid dieselisation of road transport vehicles in the last few years and the switchover from motor spirit to high speed diesel in the case of existing vehicles has led to an accentuation of this imbalance. Various suggestions for correcting this imbalance or at least for reducing its magnitude have been under consideration—measures such as technological improvements to increase the output of middle distillates, fiscal measures aiming at retarding the growth of consumption of high speed diesel oil, development of mixed fuel engines and the use of surplus motor spirit (petroleum naphtha) as a raw material for fertiliser manufacture and town gas production.

II. Programme of Development in the Third Plan:

Estimated requirements.—Based on the estimates made by the Working Group on Fuel, the Draft Outline of the Third Five Year Plan indicated that the demand for petroleum products in 1965-66 would be not less than 10 million tons as compared with 6·28 million tons in 1959. In making this estimate, the Working Group took note of the fact that even after the establishment of the new refineries planned in the public sector under the Second Plan, indigenous production of kerosene will be short of the foreseeable demands in 1965 and this would give rise to continued imports of kerosene. Having regard to the fact that self-sufficiency in kerosene by setting up new refineries cannot be envisaged without at the same time creating considerable surplus of motor spirit and that the drain on foreign exchange would have to be reduced to the minimum, the Working Group considered that a certain restriction in the consumption of kerosene would be warranted if there was an undue tendency for the demand to rise.

In regard to high speed diesel oil the estimates made by the Working Group were on the basis of 100% increase in the number of diesel-operated vehicles plying on the roads by the end of the Third Plan on which assumption the requirements of diesel oil for road transport were reckoned to be doubled during the Third Plan period. It also made allowance for the diesel oil required by the railways in connection with their dieselisation programme and for industrial and other uses. Subsequently the Oil Advisory Committee under the Department of Mines and Fuel estimated the requirements of petroleum products by the end of 1965 at about 12 million tons. The break-up of the demand estimates is given in the table under the following para.

Estimate of production and Installation of further capacity.—The estimated requirements of end products by 1965 and the expected output of the refineries in operation and under construction are given in the following table:

('000 tons)

End-Products	Estimated requirements by 1965		Refineries in operation (Private sector)	Refineries under construction (Public sector)	Total production*	Deficit or surplus (—)(+)
	As given in Draft Outline	As estimated by Oil Advisory Committee in March, 1961				
Kerosene . .	2,200	2,660	916	366	1,282	—1,378
High Speed Diesel Oil.	1,800	2,607	1,064	514	1,578	—1,029
Motor spirit .	1,300	1,123	1,023	514	1,537	+414
Aviation Turbine Fuel (ATF).	300	408	..	189	189	—219
Aviation spirit .	60	53	..	10	10	—43
Furnace oil .	2,200	2,753	1,619	311	1,930	—823
Light Diesel oil .	700	872	511	208	719	—153
Bitumen . .	700	628	394	120	514	—114
Jute Batching oil	100	80	47	..	47	—33
Vapourising oil, mineral turpentine, solvent oil, paraffin wax.	100	130	46	..	46	—84
Lubricants .	500	409	21	50	71	—338
TOTAL .	9,960	11,723	5,641	2,282	7,923	—4,214 +414†

*This does not include the production from refinery in Gujerat.

†Motor spirit.

It will be noted from the table above that while the demand for lubricants is expected to go up to 400,000 tons by 1965, production from the existing refineries and those under construction will meet only a very small part of it. With a view to meeting the requirements in respect of this product by further indigenous production, a project report is being obtained to establish in the public sector a plant for the manufacture of high viscosity index lubricating oil products. Also a proposal is under consideration for establishing a plant for this purpose in association with private enterprise.

Apart from the completion of the refineries under construction at Nunmati and Barauni, the programme for the Third Plan includes the establishment of a third public sector refinery with an annual capacity of about 2 million tons of crude throughput in Gujerat. This refinery will be based on the crude oil reserves proved in the Cambay Ankleshwar region. The product pattern of this refinery is proposed to be designed as in the case of the Nunmati and Barauni refineries to cover as far as possible the deficits in kerosene and diesel oil. The current expectation is that this refinery will be completed by the end of 1964. The capacities of the Nunmati, Barauni and Gujerat refineries may also be expanded from 4·75 million tons to at least 6 million tons per annum, contingent on sufficient additional indigenous crude becoming available during the Third Plan period.

On completion of the refinery in Gujerat, the capacity for petroleum refining is expected to reach a figure of 10·75 million tons as indicated below :

	(million tons)
Refineries in the private sector	6·00
Assam (Nunmati) refinery	0·75
Barauni refinery	2·00
Gujerat refinery	2·00
TOTAL	10·75

Excluding the Gujarat refinery whose production pattern is yet to be decided, production from other refineries is visualised as given below :

('000 tons)

Products	1961-62	1962-63	1963-64	1964-65	1965-66
Light distillates	1,102	1,274	1,547	1,547	1,547
Kerosene	998	1,178	1,471	1,471	1,471
Diesel Oils	1,666	1,892	2,297	2,297	2,297
Heavy ends	1,676	1,781	1,930	1,930	1,930
Lubricants	21	34	71	71	71
Others	93	93	93	93	93
Bitumen	394	423	514	514	514
TOTAL	5,950	6,675	7,923	7,923	7,923

Investment and employment.—It is estimated that an investment of Rs. 73·5 crores with a foreign exchange component of Rs. 33·4 crores would be required to be made on the three public sector refineries and the lubricating oil plant in the public sector during the Third Plan period. It is estimated that about 7,000 persons will be employed in the industry by 1965-66.

Crude oil supplies to the refineries.—The coastal refineries at Bombay and Vishakhapatnam are based on supplies of crude oil imported from the Middle East in the case of Bombay and Indonesia in the case of Vishakapatnam. Trial production of crude oil has started from the newly discovered field at Ankaleshwar and arrangements have been made with the refineries at Bombay to refine this indigenous crude. To the extent production in this area can be stepped up, increased supplies of indigenous crude might be available for the refineries at Bombay. Such supplies will definitely last till the new refinery in Gujerat is commissioned and possibly even thereafter, if production can be stepped up from the Gujerat oil-fields. The existing refinery of the Assam Oil Company at Digboi draws its supplies of crude oil from its own oil-field supplemented by supplies from the Oil India concessions. The Digboi refinery may have to draw supplies in increasingly larger quantities from Oil India as production from their own oil-field is declining.

The two new refineries that are under construction at Gauhati and Barauni will draw their supplies from the Nahorkatiya-Moran fields which are being developed for an annual production of about 3·0 million tons. Oil from this area will be transported by a pipeline extending from the Nahorkatiya-Moran fields *via* Gauhati to Barauni. The pipeline, 720 miles in length, and estimated to cost Rs. 41·36 crores on its construction, has been designed for a throughput of 4 million tons upto Gauhati and 3·25 million tons beyond that point. This is with a view to taking advantage of any additional production that may become available from these fields in due course.

Though at present there is no indigenous production of crude oil, except for a small quantity obtained from the Digboi area in Assam, an annual production of 2·75 million tons will become available from the Nahorkatiya area in Assam which is being exploited by the Oil India. This output is expected to be achieved by the end of 1963 and in step with the demands from the Nunmati and Barauni refineries. Oil India has recently been given a concession over certain additional portion adjacent to their existing leasehold areas and if the exploration in these areas proved additional reserves, its production would increase. To the extent that increased throughput can be handled by the pipelines under construction and the refineries at Nunmati and Barauni, no large increase in further refining capacity may be necessary. In the event of a very much larger production potential being established in the Oil India areas, it may become necessary to expand refinery capacity in that area.

The oil reserves indicated in the Gujerat Oil-fields are expected to be developed for an annual production of 2·0 million tons which will be refined in the new refinery in Gujarat which is included in the Third Plan.

The crude oil requirements of the Digboi, Nunmati and Barauni refineries will be met from the oil-fields that are being developed in Assam and those of the Gujarat refinery will be from the Gujarat oilfields. The three coastal refineries are at present based on imported crude oil and their annual requirements will be of the order of 6·0 million tons which will have to be mainly arranged through imports during the Third Plan period.

Petroleum Naphtha and Green Coke.—In the context of the existence of a surplus in motor spirit, *vis-a-vis* the estimated demand for gasolene in the Third Plan period, petroleum naphtha is being considered as a feed-stock for fertilizer manufacture. The requirements of fertiliser plants (existing and project) are estimated at about 492,000 tons in 1966. In addition, the naphtha is also required for the Bombay town gas scheme and the petro-chemical industries that are likely to be developed during the Third Five Year Plan period. As the picture regarding the developments in the field of petro-chemicals is not yet clear, it has not been possible to make an estimate of the requirements over and above the demands of the fertilizer industry. When available, the report of the Committee on Petro-chemicals set up by the Government of India will facilitate a more precise forecast of the consumption requirements of petroleum naphtha by 1965-66.

The estimated requirements of calcined petroleum coke—mainly for the aluminium plants—is reckoned at 58,000 tons; against this demand, the indigenous availability of green coke will be about 112,000 tons—39,000 tons from the Gauhati refinery and 73,000 tons from the Barauni refinery.

Miscellaneous.—Apart from the investments on the programmes relating to refineries, the Third Plan envisages an outlay of the order of Rs. 174 crores in related activities which are mentioned below :

(a) An outlay of Rs. 115 crores is envisaged for exploration and production of crude oil by the Oil and Natural Gas Commission. In addition, Oil India, which is a joint venture of the Government of India and the Burmah Oil Company will be exploring for oil in certain additional regions covering an area of about 1,800 square miles. A total production of 6 million tons from indigenous sources is expected to be established by the end of the Third Plan period.

(b) In connection with the distribution of the refined products from the Barauni and Gauhati refineries, a system of product pipelines extending from Barauni to Calcutta and from Barauni to Delhi is also envisaged in the Plan. This is estimated to involve a capital expenditure of Rs. 37 crores.

(c) An outlay of Rs. 10 crores has been indicated for the Indian Oil Company—the Government Distribution Organisation.

(d) The establishment in the public sector of a plant for the manufacture of 100,000 tons of high viscosity index lubricants is included in the Plan. This is estimated to cost Rs. 12 crores.

In addition, the establishment of a gas fractionation plant in the Nahorkatiya area and a gas distribution system in Upper Assam are included in the Plan of the Assam Government.

61. INDUSTRIAL ALCOHOL

1. Review of Progress in the Second Plan :

Targets.—Based on the anticipated requirements of power and industrial alcohol during the Second Plan period, a combined production target of 30 million gallons was envisaged for 1960-61. A capacity target of 36 million gallons was suggested to obtain a production of 30 million gallons.

Capacity and production.—At the commencement of the Second Plan there were 19 power alcohol distilleries with an annual capacity of about 14·9 million gallons of power alcohol and 2·9 million gallons of industrial alcohol. In addition, there were 24 distilleries producing potable and industrial alcohol. The capacity of these units for industrial alcohol was estimated at 9·3 million gallons. The total capacity for industrial alcohol was thus estimated at 12·2 million gallons and that for both power and industrial alcohol at 27·1 million gallons.

During the Second Plan period 11 new distilleries (including regularisation of 4 old distilleries) with an annual capacity of about 6·7 million gallons and expansion of 10 existing units with a capacity of 6·6 million gallons were completed. The details of these schemes are given in Appendix I. During this period one distillery *viz.* Sultanganj in Bihar with a capacity of about 0·4 million gallons was closed. The capacity of the alcohol industry at the end of the Second Plan thus stood at about 40 million gallons exceeding the target of 36 million gallons envisaged in the Plan. The State-wise distribution of this capacity is as follows :

State	Number of distilleries	Annual capacity ('000 bulk gallons)
Uttar Pradesh	20	21,923
Andhra Pradesh	6	4,254
Maharashtra	6	4,258
Bihar	4	2,208
Punjab	3	1,816
West Bengal	3	1,550
Kerala	3	600
Mysore	2	1,680
Rajasthan	2	487
Madhya Pradesh	2	420
Madras	1	720
Gujarat	1	187
TOTAL	53	40,103

The production of alcohol from 1955 onwards is given below :

	(million bulk gallons)
1955	15·6
1956	14·5
1957	15·2
1958	15·0
1959	15·4
1960	19·9

The production of alcohol was more or less static during the first four years of the Plan. It has shown some improvement in 1960. The production has not advanced sufficiently to reach anywhere near the target of 30 million gallons laid down in the Plan, mainly because the demand for alcohol has not developed sufficiently as was envisaged in the Plan.

Imports and exports.—There are no imports of alcohol except for small quantities which come along with drugs and perfumed spirits and in the form of liquors.

With a view to earning the much-needed foreign exchange, an export promotion programme for alcohol was chalked out in 1958 which was given a push by the Development Council for Alcohol and other Fermentation Industries after its constitution in September, 1958. Storage tanks were installed at Kandla and Budge Budge (Calcutta) for the purpose. Consequently, there was a spurt in exports in 1960 as is evident from the following foreign trade statistics :

	Exports (Rs. in lakhs)
1957	7·7
1958	6·2
1959	8·8
1960	28·8

Consumption.—The demand for power alcohol and industrial alcohol was expected to rise to 18·0 million gallons and 12·0 million gallons respectively in the final year of the Second Plan. In actual practice, the production of the two varieties in 1960, which can be equated to their consumption, was only about 10·9 million gallons and 9·0 million gallons respectively. The consumption has lagged behind the targets because the demand has not developed as was expected at the time of the formulation of the Plan.

The problem of surplus gasolene has stood in the way of the increased use of power alcohol in admixture with petrol whereas the delay in the establishment of alcohol-consuming industries has been the cause of lag in demand for industrial alcohol.

Inyestment.—It is estimated that a capital investment of about Rs. 2·0 crores was made on new units and substantial expansions in the alcohol industry during the Second Plan period. Its foreign exchange component is estimated at Rs. 25 lakhs.

Alcohol Committee.—The Committee appointed by the Government of India in October 1955 to study and examine the state of the alcohol industry and to make recommendations for its improvement and expansion submitted its report in December, 1956. Among other recommendations, the Committee suggested, on the basis of the expected supplies of molasses from 1959-60 onwards, the targets of capacity and production at 52 million gallons and 46·8 million gallons per annum respectively. The constitution of a development council for fermentation industries including alcohol and products based on alcohol was also recommended. Both these recommendations were accepted by the Government and the Development Council for Alcohol and other Fermentation Industries was constituted in 1958. The Council was re-constituted in 1960 and designated as the "Development Council for Organic Chemical Industries" to cover alcohol and other products of fermentation industries, dyes and intermediates, plastics, insecticides, petro-chemicals etc.

Control over price and distribution of alcohol and molasses.—The Alcohol Committee had recommended that in order to encourage the use of alcohol as a raw material for industries, control should be exercised over its price and distribution. As molasses had been and would continue to be the principal raw material for production of alcohol, control over its price and distribution was also recommended in order to keep the price of alcohol at a low level. The Government has recently fixed the maximum ex-distillery prices of absolute alcohol and rectified spirit. Control over the price and distribution of molasses is being exercised by some of the State Governments through their Molasses Control Orders and the Central Molasses Control Order, 1961 has been introduced in most of the other States where there is no State Molasses Control Order.

Action on recommendations made in the Plan.—It was recommended that for a steady growth of the power alcohol industry the manufacturers should actively sponsor schemes for research into problems connected with the industry. With the constitution of the Development Council for the Alcohol Industry, this aspect is now being looked after by that body. The Development Council has constituted a Standing Research Advisory Committee to recommend suitable schemes for research work connected with the industry.

It was also recommended that the industry should make attempts to reduce its coal cosumption by modernising plants so as to secure more economic production. Nothing much by way of modernisation of plants with a view to reducing coal consumption seems to have been done during the Second Plan period mainly due to slack conditions prevailing in the industry. The Development Council has, however, worked out the norms of efficiency for steam consumption and recommended them to the industry for implementation.

APPENDIX I

New units and substantial expansions completed during the Second Plan period

Name of the distillery	Capacity added ('000 bulk gallons)
A. New Units	
M/s Pilkhani Distillery & Chemical Works Ltd., Pilkhani (U.P.)	1,000
M/s Upper Ganges Sugar Mills, Seohara (U.P.)	1,200
M/s Modi Distillery, Modinagar (U.P.)	1,000
M/s Sir Shadilal Sugar & General Mills Ltd., Mansurpur (U.P.)	1,000
M/s Godavari Sugar Mills Ltd., Sakarwadi (Maharashtra)	468
*M/s Maharashtra Sugar Mills Ltd., Tilaknagar (Maharashtra)	540
*Government Distillery, Narayanguda (Andhra Pradesh)	450
M/s Sri Rama Sugars & Industries Ltd., Bobbili (Andhra Pradesh)	300
*M/s Polson Distillery, Chalakudi (Kerala)	180
M/s Mcdowell & Co. Ltd., Shertalai (Kerala)	240
*M/s Udaipur Distillery Co., Udaipur (Rajasthan)	300
B. Substantial Expansions	
M/s Daurala Distillery, Daurala (U.P.)	1,500
M/s Central Distillery & Chemical Works Ltd., Meerut (U.P.)	660
M/s Shami Distillery & Chemical Works Ltd., Shamli (U.P.)	140
M/s Narang Industries Ltd., Nawabganj (U.P.)	660
M/s Oudh Sugar Mills, Hargaon (U.P.)	564
M/s Hindustan Sugar Mills Ltd., Gola (U.P.)	500
M/s Rampur Distillery & Chemical Co. Ltd., Rampur (U.P.)	750
M/s Walchandnagar Distillery Ltd., Walchandnagar (Maharashtra)	360
Government Power Alcohol Factory, Shakkarnagar (Andhra Pradesh)	1,200
M/s Mysore Sugar Co. Ltd., Mandya (Mysore)	300

*Cases of regularisation.

APPENDIX II

New units and substantial expansions under implementation at the end of the Second Five Year Plan

Name of the distillery	Nature of the scheme	Annual capacity in '000 bulk gallons
M/s New Swadeshi Sugar Mills Ltd., Narkatiganj (Bihar)	N.U.	960
M/s Ajudhia Distillery Ltd., Raja-Ka-Sahaspur (U.P.)	S.E.	540
M/s Kolhapur Sugar Mills Ltd., Kolhapur (Maharashtra)	S.E.	780
Madhya Pradesh Govt. Alcohol Factory, Ratlam (M.P.)	N.U.	1,080
M/s Kesar Sugar Works, Baheri (U.P.)	S.E.	870
Government Distillery, Chitali (Maharashtra)	N.U.	2,700
M/s Andhra Sugar Ltd., Tanuku (Andhra Pradesh)	N.U.	800
M/s Cawnpore Sugar Works, Ltd., Marhowrah (Bihar)	S.E.	86
M/s Upper Doab Sugar Mills Ltd., Shamli (U.P.)	S.E.	400
M/s Ugar Sugar Mills Ltd., Ugar Khurd, Dist. Belgaum (Mysore)	N.U.	900
M/s Sangli Cooperative Distillery, Sangli (Maharashtra)	N.U.	1,260
M/s Polychem Ltd., Nira, Distt. Poona (Maharashtra).	N.U.	1,500
M/s H. R. Sugar Factory, Bareilly (U.P.)	N.U.	1,800
M/s Khetan Distillery & Chemical Works, Padurauna, Distt. Deoria (U.P.).	N.U.	1,000
M/s Modi Sugar Mills, Modinagar (U.P.)	S.E.	400
M/s Captainganj Distillery, Captainganj (U.P.)	S.E.	1,300
M/s Daurala Distillery, Daurala (U.P.)	S.E.	500
M/s Alembic Chemical Works, Baroda (Gujarat)	S.E.	176
M/s Upper Ganges Sugar Mills, Seohara, Distt. Bijnor (U.P.)	S.E.	1,320
M/s Ratna Sugar Mills Co. Ltd., Shahganj, Distt. Jaunpur (U.P.)	N.U.	1,000
Shri V. S. Tyagarajan, Tiruchirapalli (Madras)	N.U.	2,000
M/s Rampur Distillery & Chemical Co., Rampur (U.P.)	S.E.	500
M/s Saraya Distillery, Sardarnagar (U.P.)	S.E.	900
M/s R. B. Gujjarmal Modi & Bros., Yamunanagar (Punjab)	N.U.	1,200

II. Programme of Development in the Third Plan :

Estimated requirements.—The target of sugar production in the Third Plan has been fixed at 3·5 million tons. This would yield about 1·225 million tons of by-product molasses at an average rate of 35% of sugar production. In view of the arrangements contemplated for improved storage and transport of molasses, it is considered reasonable to assume that 90% of the estimated output would be available for the manufacture of alcohol. Assuming a yield of 53 gallons of alcohol per ton of molasses, the production of alcohol corresponding to the sugar target of 3·5 million tons may be estimated at 58·5 million gallons. Production of another one million gallons may be expected to continue as at present from 'mahua' flowers. The total production of alcohol in 1965-66 may thus be estimated at about 60 million gallons.

The problem of surplus gasolene will become accentuated during the Third Plan period with the commissioning of the oil refineries planned in the public sector. While the scheme for blending of petroleum with power alcohol has recently been withdrawn in certain States, such a step is also contemplated in respect of remaining States as soon as off-take of alcohol for industrial purposes (including exports) develops further.

Of the expected production of 60 million gallons of alcohol, approximately 10 million gallons will be required for use in the manufacture of potable spirits and in ordinary denatured spirit. About 50 million gallons will, therefore, be left for utilisation as raw material for industries. There should be no difficulty about the utilization of this alcohol by the consuming industries as the estimated demand in 1965-66 is over 50 million gallons. In fact, some of the industries usually based on alcohol may have to be linked with alternative feedstocks. The more important consuming industries which would need more than half a million gallons of alcohol per annum are listed below :

Name of the industry	Product	Alcohol requirement (million gallons)
1	2	3
M/s Sirsilk Ltd., Sirpur—Kaghaznagar (Andhra Pradesh).	Acetic acid and acetate rayon .	1·2
M/s Kolhapur Sugar Mills, Kolhapur (Maharashtra).	Butyl alcohol, acetic acid, etc. .	1·2
M/s Godavari Sugar Mills, Barabanki (U.P.)	Butyl alcohol, acetone and derivatives.	1·5
M/s Andhra Sugars, Tanuku (Andhra Pradesh)	Acetic acid and acetic anhydride	0·6
M/s Indian Organic Chemicals Ltd., Bombay	Acetic acid . . .	0·9
M/s Mysore Sugar Co. Ltd., Mandya (Mysore).	Cellulose acetate . . .	0·8
M/s Modi Spinning and Weaving Mills Co. Ltd., Modinagar (U.P.).	Acetate rayon . . .	1.5
M/s Polychem Ltd., Bombay . .	Styrene	1·2

1	2	3
M/s Alkali & Chemical Corp. of India, Rishra (W. Bengal).	Polyethylene	5·2
M/s Union Carbide India Ltd., Trombay (Maharashtra).	Polyethylene, butyl alcohol, acetic acid, etc.	2·5
M/s Shree Ram Mills Ltd., Andhra Pradesh.	Styrene & Polystyrene . .	1·9
M/s Synthetics & Chemicals Ltd., Bareilly (U. P.).	Synthetic rubber . . .	20·0
M/s East Anglia Plastics (India) Ltd., Andhra Pradesh.	Cellulose acetate . . .	0·6

Targets of capacity and production.—In view of the estimates made in the foregoing paragraphs, the production target for alcohol in the Third Plan is envisaged at 60 million gallons. Taking into consideration the inherent difficulties involved in the operation of alcohol factories continuously at full capacity owing to the seasonal character of the supplies of molasses and the unhappy location of some of the existing distilleries in respect of raw material supplies, somewhat higher target of capacity *viz.* 72 million gallons is envisaged.

Additional capacity required.—In addition to the capacity of about 40 million gallons existing at the end of the Second Plan, a capacity of about 24 million gallons has been licensed and is at various stages of implementation. The details of the licensed schemes are given in Appendix II. In order to attain the target of 72 million gallons, licensing of an additional capacity of about 8 million gallons is required.

Investment and employment.—It is estimated that an investment of about Rs. 4·0 crores will be required during the Third Plan period for achieving the capacity target of 72 million gallons. Its foreign exchange component is estimated at Rs. 40 lakhs.

The additional employment which will be provided by the development of the alcohol industry in the Third Plan is estimated at 5,000.

Requirements of raw materials.—The most important raw material required by the industry is molasses although small quantities of alcohol are also produced from 'mahua' flowers. The production target of alcohol has been linked with the expected supplies of molasses resulting from the production target of sugar envisaged in the Third Plan. In view of the probability of the demand for alcohol outstripping the possible production from increased availability of molasses during the Third Plan period, alternative raw materials are already being looked for. The Alcohol Panel of the Development Council for Organic Chemical Industries has appointed a sub-committee to go into the question of the manufacture of alcohol from tapioca grown in Kerala.

The fuel requirements of industry are estimated at 250,000 tons of coal per annum in the final year of the Plan.

The table below summaries the development programme for the alcohol industry in the Third Five Year:

	1960-61	1965-66
Capacity (million gallons)	40·1	72·0
Production (million gallons)	20·4	60·0

62. INDUSTRIAL GASES

The scope of the development programme for this industry covers oxygen, dissolved acetylene, carbon dioxide and nitrous oxide gas.

Industrial gases have vast applications and modern technological changes are further widening the sphere of their use. Oxygen along with acetylene is used extensively in the oxy-acetylene flames for generating high temperature (3,000°F) which enables welding, cutting and heating. Apart from being used in the catalytic processes for manufacture of several heavy chemicals, a relatively recent example of the industrial utilisation of oxygen is its application in the steel industry under the L.D. process and top pressure techniques of blast furnace operations, both of which were proposed for adoption at the steel plants (Rourkela and Bhilai) in India under the Second Plan. Liquid oxygen is also being used for industrial explosive, as laboratory refrigerant and for cold treatment of tools. Compressed oxygen is also used as medical oxygen, for breathing oxygen in air craft and for transportation of fish. To bulk consumers, it is often delivered as liquid but is evaporated in special equipment at customers' premises and then used as gas. Dissolved acetylene, apart from its use in the oxy-acetylene flame, is also used for lighting particularly marine (*e.g.* buoys and light ships). Carbon dioxide gas has got demands in aerated water industry, steel foundry, motion picture industry etc. Its most important outlet in chemical industries is for the manufacture of urea, for which use it is normally recovered as a by-product. Nitrous oxide gas is used as a mild anaesthesia in hospitals.

I. Review of Progress in the Second Plan:

In the development of oxy-acetylene industry M/s. Indian Oxygen and Acetylene Company Ltd. have acquired an unique position since 1935, when the principal producing units in operation in the country were purchased by it and brought under amalgamation. Its installations as in 1935 comprised of dissolved acetylene factories both at Calcutta and at Bombay, four oxygen plants (two at Calcutta, one at Jamshedpur and one at Bombay), one oxygen compressing station at Bombay, leaving aside oxygen plants at Lahore and Colombo. Considerable expansion of oxygen and acetylene supply facilities was achieved by this Company during the Second World War and new installations were brought into existence at Burnpore, Kanpur, Bangalore, Madras and Dibrugarh. Since January, 1958, the Company has been redesignated as M/s. Indian Oxygen Limited and as a result of the sale made by M/s. British Oxygen Company Limited in early 1958, Indian capital representing 6 lakhs out of 20 lakhs of ordinary shares of Rs. 10 became associated for the first time in the history of his Company, M/s. Asiatic Oxygen and Acetylene Company entered the industry in 1941 with Calcutta as the location of its plant of annual capacity of 7·2 million cft. of oxygen and 3·6 million cft. of dissolved acetylene. The more recent entrants into this industry are M/s. Industrial Gases Ltd. Kanpur and M/s. Modi Vanaspati Manufacturing Company, Modinagar.

Targets.—No development programme for this industry was formulated in 1956. The following estimates of requirements for 1960-61 proposed by

the Development Wing were taken as the basis for regulating the expansion of the capacity of this industry under the Second Plan:

Oxygen	1,000 million cft.
Dissolved acetylene	150 million cft.
Carbon dioxide	27 million lbs.
Nitrous oxide gas	15 million gallons.

Capacity and production.—A picture of the position obtaining at the beginning and close of the Second Plan in respect of the industrial gases covered under the development programme can be had from the data presented below. The annual capacity is reckoned on the basis of triple shift operation:

Annual Capacity—Oxygen gas

(in million cft.)

State	At the beginning of the Second Plan period		At the end of the Second Plan period		Capacity developed in the Second Plan period
	Unit	Capacity	Unit	Capacity	
Assam	—	—	1	17·3	17·3
Andhra	1	10·8	1	18·0	7·2
Bihar	1	151·2	1	259·2	108·0
Delhi	1	29·5	1	29·5	—
Gujarat	1	7·2	1	7·2	—
Madras	2	22·7	2	61·0	38·3
Mysore	1	13·1	1	13·1	—
Maharashtra	1	59·3	2	124·4	65·1
Punjab	—	—	1	3·0	3·0
U.P.	3	42·8	4	81·5	38·7
W. Bengal	2	130·2	3	420·0	289·8
TOTAL	12	466·8	18	1,034·2	567·4

Annual Capacity—Dissolved Acetylene gas

(in million cft.)

State	At the beginning of the Second Plan period		At the end of the Second Plan period		Capacity developed in the Second Plan period
	Unit	Capacity	Unit	Capacity	
1	2	3	4	5	6
Andhra Pradesh	1	6·5	1	6·5	—
Bihar	1	6·5	1	19·4	12·9
Delhi	1	6·5	1	13·0	6·5
Gujarat	—	—	1	4·3	4·3
Madras	1	6·5	1	13·0	6·5

1	2	3	4	5	6
Mysore	1	2·2	1	2·2	—
Maharashtra	1	25·9	1	34·2	8·3
U. P.	3	13·0	3	16·5	3·5
West Bengal	3	37·3	4	53·4	16·1
TOTAL	12	104·4	14	162·5	58·1

Annual Capacity—Carbon Dioxide gas

(in million lbs.)

State	At the beginning of the Second Plan period		At the end of the Second Plan period		Capacity developed in the Second Plan period
	Unit	Capacity	Unit	Capacity	
Andhra	—	—	3	9.6	9·6
Delhi	1	1·2	1	2·5	1·3
Gujarat	—	—	1	2·4	2·4
M.P.	1	2·2	—	—	—2·2
Madras	4	6·7	4	5·4	—1·3
Mysore	1	2·6	1	2·6	—
Maharashtra	2	12·2	2	13·9	1·7
Punjab	2	2·4	2	2·1	—0·3
W. Bengal	3	2·8	2	3·8	1·0
TOTAL	14	30.1	16	42·3	12·2

In respect of nitrous oxide gas only one firm—M/s. Indian Oxygen Ltd.—undertakes its manufacture at present. The installed capacity is 21·6 million gallons per year.

The annual production of these gases in 1951, 1955 and in each year of the Second Plan was as shown below:

	Oxygen gas (million cft.)	Dissolved acetylene gas (million cft.)	Carbon dioxide (million lbs.)	Nitrous oxide gas (mil lon gallons)
1951	145·2	29·9	N.A.	N.A.
1955	282·8	47·4	N.A.	N.A.
1956	328·3	55·3	9·9	7·0
1957	405·0	64·0	10·7	9·8
1958	478·3	74·3	12·2	11·0
1959	588·7	84·3	13·8	15·0
1960	717·4	88·8	16·9	19·6

Taking the rates of oxygen gas to be Rs. 30,000 per million cft., dissolved acetylene gas Rs. 1·8 lakhs per million cft., carbon dioxide gas Rs. 4·2 lakhs

per million lbs. and nitrous oxide gas Rs. 90,000 per million gallons, the value of the production of 1960 comes to Rs. 2·15 crores, Rs. 1·60 crores, Rs. 0·71 crore and Rs. 0·18 crore respectively.

The following Indian Standards specifications have been formulated for the industrial gases:

Indian Standard specification No. 307 for carbon dioxide gas.

Indian Standard specification No. 308 for dissolved acetylene gas.

Indian Standard specification No. 309 for compressed oxygen gas.

Indigenous manufacturers generally follow the above specifications in respect of the quality for their production.

Export.—Export of nitrous oxide gas in small quantities has been effected in the past to Ceylon, Singapore, Hongkong and Burma mainly. The past export, yearwise was as given below:

	(Rs. lakhs)
1957	0·62
1958	0·79
1959	1·38
1960	1·51

Investment.—Total investment inclusive of the expenditure on gas cylinders along with the foreign exchange component thereof, on the establishment of additional capacity under the Second Plan period was as follows:

(Rs. lakhs)

	Total investment	Foreign exchange
Oxygen Gas	635	510
Dissolved acetylene gas	135	70
Carbon dioxide gas	20	15
Nitrous oxide gas	3	1
TOTAL	793	596

Broadly the total investment can be taken to be Rs. 8 crores with the foreign exchange component of Rs. 6 crores. This is exclusive of the investment on captive tonnage plants under the iron & steel and nitrogenous fertiliser industries *e.g.* Rourkela, Bhilai, Durgapur & Nangal. The investment of M/s. Indian Oxygen Ltd. in the Second Plan period was Rs. 3·5 crores out of this total.

Problems of the industry.—The high price of calcium carbide, and the difficulties connected with foreign exchange allocation for import of cylinders and on maintenance account were the main problems faced by this industry. Lack of sufficient experienced engineers and skilled operators has also hampered production.

II. Programme of Development in the Third Plan:

Estimate of requirements.—The requirements of the four industrial gases by the Third Plan were estimated to register a substantial expansion as explained below:

Oxygen.—Due to the wide use of oxygen for heating, joining and severing of steel, efforts to establish a relationship in respect of consumption of oxygen per ton of finished steel were made. In India, based on the present consumption rate, the figure is 180 cft. per ton of finished steel as compared to 200 to 300 cft. per ton of finished steel in industrially advanced countries of the West. Taking 200 cft. per ton, which is considered to be a realistic figure for the Third Plan period and based on a targetted production of 6·8 million tons of finished steel, the annual oxygen requirement for welding and cutting comes to 1,360 million cft. A further requirement of 300 million cft. per annum as liquid oxygen in explosives has also been envisaged by 1965-66. Without including the tonnage oxygen requirement of the steel and fertiliser plants to be made from captive plants, the aggregate demand for oxygen by 1965-66 has been estimated at 1,660 million cft.

Dissolved acetylene.—As major part of the production of dissolved acetylene is required for cutting and welding of steel in various engineering industries, the consumption of this gas can be taken to follow generally the increase in the consumption of steel. The steel production in the country has been targetted to increase by 3 times from 1960-61 to 1965-66. Applying same ratio, the requirement of this gas by 1965-66 comes to 270 million cft.

Carbon dioxide gas.—The demand of carbon dioxide gas is increasingly developing in the aerated water industry, in steel foundry, in motion picture industry, in packing of cashew nuts, in fire extinguishers etc. On these accounts the requirements of carbon dioxide has been estimated to go up by 50% by 1965-66 as compared to the 1960-61 level. Taking the actual requirements of this gas in 1960-61 at 27 million lbs., as was originally estimated by the Development Wing, the estimate for 1965-66 comes to 40 million lbs.

Nitrous oxide gas.—Along with the increase in the living standards and the increasing population, a steady annual increase in the requirements of nitrous oxide gas at the rate of one million gallons per year is considered reasonable. Keeping necessary margin for exports, the requirements can be estimated to be 20 million gallons.

Targets.—Taking all relevant factors into consideration, the following capacity and production targets have been envisaged for 1965-66:

Oxygen	Capacity	2,300 million cft.
	Production	1,650 million cft.
Dissolved acetylene	Capacity	250 million cft.
	Production	200 million cft.
Carbon dioxide	Capacity	48 million lbs.
	Production	40 million lbs.
Nitrous oxide gas	Capacity	24 million gallons.
	Production	20 million gallons.

The fixation of production targets has been made on the basis of estimated requirements. A capacity utilisation factor of 70% has been taken for oxygen while fixing the target capacity. In respect of other gases a capacity utilisation factor of 80% has been taken.

Schemes licensed and under implementation.—The schemes licensed in the Second Plan period and expected to be in varying stages of implementation at the commencement of the Third Plan are given in the following table. The capacity is given on three shift basis:

Firm	Oxygen (million cft.)	D. Acetylene (million cft.)	Carbon dioxide (million lbs.)	Nitrous oxide gas (million gallons)
M/s. Indian Oxygen Ltd. (a number of regional units).	503·5	1·8	..	21.6
M/s. Asiatic Oxygen & Acetylene Co. (a number of regional units).	100·8	26.28	..	..
M/s. Babubhai Manecklal Chinai, Bombay.	78.8	22·9	..	..
M/s. Hindustan Gas Co., Calcutta	36·0	12·0	..	..
M/s. Supreme Motors Ltd., Jaipur	7·2	2·4	..	..
M/s. National Air Products Ltd., Delhi	21·12	6.0	..	..
M/s. Siddhomal & Sons, Bombay	16·5	3·3	..	..
M/s. Surajmal Mehta & Co., Delhi.	60·0	6·0	..	..
M/s. Sanghi Motors, Bombay	28·8	9·6	..	..
M/s. Industrial Gases, Barauni	24·0	6·0	..	..
M/s. Sun Engineering Corp., Ahmedabad	27·6	2·12	..	..
M/s. Bharat Oxygen Co., Ludhiana	15·12	..	..	..
M/s. Jindaram Harbilas, Calcutta	56·1	..	..	..
M/s. South Carbonic acid gas, Madras	..	..	2·2	..
M/s. Modi Industries, Modinagar	..	..	1·2	..
M/s. Nizam Sugar factories, Hyderabad	..	..	2.0	..
M/s. Sirdar Carbonic Gas Co., Delhi	..	..	4·1	..
TOTAL	975·54	98·40	9·5	21·6

It is considered that a 100 cubic metre per hour plant which corresponds to a capacity of 30 million cubic ft. per year is the minimum economic unit for an oxygen plant. For a dissolved acetylene plant the minimum economic unit corresponds to a size of about one-fifth of above. The largest oxygen plant installed in India at present is 400 cubic metre per hours and there are already indications that at least in certain areas, the level of demand may justify units of bigger size.

Additional capacity required.—The following table brings out the total capacity in view in respect of the four industrial gases under consideration. The capacity figures are on three shift basis:

	Unit	Installed capacity	Licensed capacity	Total capacity
Oxygen gas	million cft.	1,034·00	975·54	2,009.54
Dissolved acetylene gas	million cft.	162.50	98.40	260.90
Carbon dioxide gas	million lbs.	42·3	9·5	51·8
Nitrous oxide gas	million gallons	21·6	21·6	43·2

It will thus be seen from above that there will hardly be any difficulty in achieving the targets and that there will be only marginal scope for further expansion of this industry during the Third Plan period. In the context of additional licensing due account should be taken of the plans for internal supplies being made under major projects.

Because of the high cost of distribution over long distances in relation to the cost of production, there are limits to the size of an area that can be served by a plant or a group of plants. Planning of capacity has to give due weight to the needs of securing a regional balance between supply and demand if the incidence of transport cost has to be kept within optimum limits.

Tonnage oxygen plants as captive units.—As already pointed out, tonnage oxygen plants have been established in the Second Plan in conjunction with steel production at Bhilai, Rourkela and Durgapur and nitrogenous fertilisers production at Sindri (expansion scheme), Nangal and FACT, Alwaye. The biggest of these unit is at Rourkela linked with the L. D. process of steel making with a capacity of 300 tons of oxygen per day. Expansion of oxygen capacity is planned under the steel development programmes. Similar facilities are expected to be needed under the major alloy steel projects and wherever possible, new units to be established, will be designed to meet the combined requirements of mild and special steels production programmes.

Use of oxygen is expected to develop in a big way under nitrogenous fertiliser industry in conjunction with the adoption of the naphtha gasification process. The oil gasification process has so far been visualised under Trombay, Alwaye, Ennore, Vishakhapatnam and Gorakhpur fertiliser projects.

The investments on all these captive plants form part of the expenditure on the main projects.

Investment and labour.—The overall investment during the Third Plan period for the oxygen gas and the dissolved acetylene gas industries have been estimated to be Rs. 9·7 crores and Rs. 1·3 crores respectively. For carbon dioxide gas and nitrous oxide gas industries, the investment is small and may be visualised at Rs. 0·2 crore. Thus the total investment comes to Rs. 11·2 crores of which the foreign exchange element may be about Rs. 6·1 crores.

Additional employment in this industry during the Third Plan period has been estimated to be 700.

Problems of distribution.—Distribution of gases regularly at economic price to the ultimate consumers constitutes one of the main problems of this industry. So far the distribution has been based on packing of gases in high pressure steel cylinders and transporting the same through railways or road transport to the point of ultimate consumption. Some oxygen manufacturing firms have installed liquid oxygen storage plants in the premises of big consumers and from these liquid oxygen storage plants, the oxygen is piped after being evaporated to gas through steel pipes to the different points of consumption in the consumer's factory. This method is convenient and economic but can only be limited to big consumers. Therefore, the major part of the industrial gases has to be transported in cylinders to the consumers. The gas cylinders have to be packed with gases in production centres, sent to the consuming centres for utilisation, wherefrom the empty cylinders are to be returned again to the production units for refilling. This cycle has got to be very carefully watched and regulated particularly by producers so that the production schemes are not dislocated.

Oxygen gas is generally compressed in cylinders at high pressures of the order of 1,800 to 2,000 lbs. per sq. inch. Acetylene gas is packed in cylinders under comparatively lower pressure which may vary from 300 to 400 lbs. per sq. inch because this gas is dissolved in acetone in cylinder. 60% of oxygen and the whole of dissolved acetylene will have to be packed and distributed in cylinders. The requirement of gas cylinders *vis-a-vis* the production targets for 1965-66 and the percentage thereof to be bottled, as estimated is given below :

Requirement of gas cylinders of 220 c.ft. capacity for oxygen gas, assuming 15 cycles per year.	3 lakh nos.
Requirement of gas cylinders of 220 c.ft. capacity for acetylene gas, assuming 12 cycles per year.	0·73 ,,

The total requirement in terms of 220 c.ft. packing capacity of gases per cylinder comes to 3·73 lakh numbers. The present stock is placed at about 1·8 lakh numbers. Taking into consideration replacement demand of 0·5 lakh numbers, over the Third Plan period, the additional requirement during the Third Plan period comes to about 2·4 lakh numbers. Additional cylinder requirements for the carbon dioxide gas has been estimated by the Development Wing at 0·6 lakh numbers of 20/40 lbs. capacity on the assumption of 10 cycles per year and for the nitrous oxides gas, at 5,000 cylinders of 100/180 gallons capacity on the assumption of 6 cycles per year. M/s. Saith and Skelton Co. Ltd. have been granted

licenses for manufacture of gas cylinders at the monthly rate of 5,000 cylinders in collaboration with an Italian party. It is expected that the entire requirement of the gas cylinders for these demands will be met from this unit.

Replacement problem.—The major replacement problem in the industrial gases industry is related to gas cylinders which have to complete about 10 to 15 cycles in a year from the factory to the consumer and back. In the transportation process some of them get damaged. It is estimated that 5% of the existing stock will be the replacement requirement.

Occasional wear and tear of some of the parts of the main plant constitute the next problem. Air filters, scrubbers, driers, coolers, electric thawing heaters, liquid oxygen filters, expansion engines, compressors etc. are required to be replaced occasionally. The replacement cost on this account has been estimated to be about Rs. 150 lakhs during the Third Plan period.

Requirements of raw materials, fuel and electricity.—Raw materials, fuel and electricity required for the production targets of 1965-66 are given below:

For oxygen gas—	
Caustic soda	740 tons.
Trichloroethylene	55 tons.
Electricity	125 million units.
Water	250 million gallons.
For dissolved acetylene—	
Calcium carbide	20,600 tons.
Acetone	640 tons.
Regental	100 tons.
Lime/kieselguhr	10·5 tons.
Alpurene	2,090 tons.
Calcium Chloride	140 tons.
Electricity	4·1 million units.
Water	60·8 million gallons.
For carbon dioxide—	
Coke for manufacture	11,000 tons.
Coal for steam (compression)	4,200 tons.
Monothanolamine	150 tons.
Electricity	14 million units
Water	75 million gallons
For nitrous oxide gas—	
Ammonium Nitrite	600 tons.
Electricity	1 million units.

The important requirement on maintenance account is expected to be confined to kieselguhr and alpurene and rest are expected to be fully indigenous.

Miscellaneous.—In recent years butane propane mixtures are being increasingly used for welding operations in the non-ferrous field and cutting operations in the ferrous field and there is reported to be a price advantage of about 30-40% in favour of the mixture as compared to acetylene. This substitution of acetylene by alternative gaseous fuels is not expected, on current appreciation of the position, to assume importance during the Third Plan period.

An oxygen plant of 400 cubic metre per hour capacity is rated as a minimum economic unit to produce argon, liquid nitrogen and various mixtures. Argon is an essential item in welding stainless steel and aluminium and is also used in the electric lamp industry. Liquid nitrogen is used, *inter alia*, in atomic energy research and in the manufacturing process for vitamin-A. Extraction of these gases has been started already from the 400 cubic metre per hour plants and should be increased to meet the growing demands also.

The following table summarises the development of this industry during the period of the Third Plan:

	At the end of Second Plan	At the end of Third Plan
Oxygen gas (million c.ft.)—		
Capacity	1,034·2	2,300
Production	717·4	1,650
Dissolved acetylene gas (million c.ft.)—		
Capacity	162·5	250
Production	88·8	200
Carbon dioxide gas (million lbs.)—		
Capacity	42.3	48
Production	16.9	40
Nitrous oxide gas (million gallons)—		
Capacity	21.6	24
Production	19.6	20

TEXTILE INDUSTRIES

63. COTTON TEXTILES

I. Review of Progress in the Second Plan:

Targets.—The programme of development formulated for the cotton textile industry in the Second Plan envisaged an increase of the installed spindleage from 12·05 millions to 13·62 millions. As against the addition to spindleage thus envisaged, licences for installation of 1·8 million spindles were outstanding at the commencement of the Second Plan. Of these, it was estimated that about 1·4 million spindles were likely to be installed. On the basis of this appreciation, it was felt that 0·17 million spindles would have to be licensed during the Second Plan period, and that these could be mainly allocated for expansions of existing mills. This programme was to be reviewed if the increase in demand for cotton textiles turned out to be faster than anticipated.

Expansion of loomage in the mill sector was tentatively envisaged for export purposes only and it was tentatively proposed that an additional 20.000 looms should be installed for achieving a production of 500 million yards of cloth in the mill sector exclusively for export. A firm decision in this regard was deferred to a later date.

As regards production, targets for the organised mill sector were set at 1,950 million lbs. of yarn and 5,000 to 5,500 million yards of cloth (depending on the additional capacity proposed exclusively for export as mentioned above) as against actual outputs of 1,630 million pounds of yarn and 5,094 million yards of cloth in 1955. The overall cloth target including the production from the decentralised sector, was envisaged at 8,500 million yards, so as to provide for an export target of 1,000 million yards in addition to the internal requirements, calculated on the basis of an estimated per capita requirement of 18·4 yards in 1960-61 (as against an estimated actual per capita consumption of 16 yards in 1955-56) and an expected population of 408 millions. The cloth production target for the handloom and powerloom sectors was therefore envisaged at 3,000 to 3,500 million yards (being the residual amount depending on the precise target to be decided upon for mill cloth) as against an actual production of 1,753 million yards in 1955-56.

The requirements of raw cotton for producing 8,500 million yards of cloth were calculated at about 6·1 million bales. Under the agriculture sector, the Second Plan envisaged a production target of 5·5 million bales of raw cotton, which implied a slight reduction in the level of imports of cotton (predominantly of the long staple variety) at the commencement of the Plan.

Subsequent to the formulation of the Second Plan, Government reviewed the targets of capacity and production for cotton textiles. Following this review it was decided to plan for a per capita consumption of 18·5 yards of cotton cloth for an estimated population of 400 millions at the end of the Second Plan. On this basis and retaining the export target at 1,000 million yards, the overall production target was slightly reduced to 8,400 million

yards. For producing the yarn required to meet this cloth production target, the additional spindleage required, over and above the installed capacity of 12·05 million spindles at the commencement of the Second Plan, was estimated at 2·1 million spindles. On 30th June, 1956, licences for installation of about 1·9 million spindles were outstanding; as against which it was estimated that about 1·65 million spindles were likely to be installed by 1960-61. It was therefore planned that 0·45 million spindles should be licensed during the Second Plan, and these should be allocated mainly for the expansion of existing mills and for installation of new cooperative spinning mills.

Modification of the allocation of the targetted cloth production between the various sectors of the industry was also made as a result of the review. It was proposed that the cloth production in the mill sector would be raised to 5,350 million yards, by installation of an additional 18,000 looms for production of 350 million yards exclusively for export. For the handloom and powerloom sector the cloth production target was envisaged at 2,900 million yards; while the balance of 150 million yards required to attain the overall production target was held in reserve to be allocated on the basis of a later review.

As against the targets thus laid down, the progress achieved by the industry during the five year period is reviewed below.

Capacity.—At the commencement of the Plan there were 121 spinning mills and 291 composite mills with an installed capacity of 12·05 million spindles and 2·029 lakh looms. The installed capacity of the mill sector of the textile industry expanded as follows during the Second Pan period:

	million spindles	housand looms
As on Jan. 1, 1956	12·05	202·9
As on Jan. 1, 1957	12·49	201·0
As on Jan. 1, 1958	13·05	201.3
As on Jan. 1, 1959	13·41	201·1
As on Jan. 1, 1960	13·55	200·3
As on Jan. 1, 1961	13·66	198·8

On 30th June, 1956, sanctions for installation of 1·82 million spindles were outstanding. Between 30th June, 1956 and 31st March, 1961, additional licences were issued for installation of about 0·95 million spindles. Details regarding the licenced spindleage are indicated below:

	Sanctions outstanding on 30-6-1956		Sanctions issued between 30-6-56 and 31-3-61	
	No. of units	'000 spindles	No. of units	'000 spindles
New undertakings	83	1,021	38	570
Substantial expansions	72	641	82	378
Normal expansions	37	153	..	..
TOTAL . .	192	1,815	120	948

As against these sanctions the progress made in installation of spindleage between 30-6-1956 and 31-3-1961 is indicated below:

	'000 Spindles
New undertakings	629
Substantial expansions	636
Normal expansions	103
TOTAL	1,368

Out of the above mentioned sanctions, approvals for 0·64 million spindles were revoked between 30-6-1956 and 31-3-1961. The position regarding outstanding sanctions for spindleage on 31-3-1961 was as follows:

	'000 Spindles
New undertakings	475
Substantial expansions	266
Normal expansions	11
TOTAL	752

The spindleage as installed by 1st January, 1961, which stood at 13·66 million spindles, was only slightly in excess of the target laid down in the Second Plan. Though the additional licences issued during the Second Plan greatly exceeded the level of 0·17 million spindles envisaged under the programme of development, the rate of implementation of approved schemes was not correspondingly faster, apparently due to the somewhat depressed condition of the industry during some of the years of the Second Plan.

The geographical distribution of textile mills at the beginning and end of the Plan period and of the additions to spindleage and loomage during the period are given in the Annexure at the end, from where it would be

seen that the Madras State has accounted for the major portion of the total expansion in spindleage, its share being about 60 per cent of the total, which is to some extent accounted for by the relatively larger concentration of handlooms in that State.

A minor portion of the additional spindleage has been set up in the co-operative and State sectors. The following schemes have been completed or are under implementation in the cooperative sector with financial assistance from the Central Government (the list excludes cooperative units which may have come up without such assistance):

State	Location	Number of spindles
	A. Schemes completed	
Andhra	Guntakal	20,036
Gujarat	Limbdi	11,872
Madras	Tirunelveli	16,000
	B. Schemes under implementation	
Andhra	Chirala	12,000
Do.	Hyderabad (Netha)	12,000
Bihar	Mokameh	12,000
Kerala	Cannanore	12,000
Madras	Ramanathapuram (Srivithiputtur)	12,000
Mysore	Dharwar	12,000
U. P.	Etawah	12,000

In the State sector the following capacities have been installed or are under implementation by, or with financial assistance from, the respective State Governments:

	Number of spindles
A. Schemes completed	
Kerala	12,000
West Bengal	50,000
B. Schemes under implementation	
Assam	25,000
Madhya Pradesh	12,500

Production.—The production of cloth and yarn and the fluctuations in stocks of cloth during the period under review have been as follows:

	Production of cloth (million yards)			Production of yarn (million lbs.)	Stock of cloth held by mills (million yards.)
	Mill made	Handloom & power loom	Total		
1955	5,094	1,753	6,847	1,630	260
1956	5,307	1,787	7,093	1,671	407
1957	5,317	1,946	7,263	1,780	676
1958	4,925	2,129	7,056	1,685	480
1959	4,920	2,258	7,183	1,723	203
1960	5,048	2,195	7,243	1,737	340

It will be seen from the figures above that mill cloth production had been steady around 5,000 million yards per year during the Plan period except for the higher levels attained in 1956-57. The preferential levy of excise duty on coarse dhoties and sarees and rebate of excise duty allowed to mills on excess over normal production during 1956-57 had contributed to the high level of production during these years in the form of an abnormal increase in production of coarse dhoties and sarees. This led to accumulation of stocks and difficulties to the industry. The imbalance in production was later corrected by the reduction and rationalisation of the excise tariff on mill cloth made on the recommendations of the Joshi Committee (1958). On the recommendations of this Committee, Government further accepted that an estimate of per capita consumption of 17·5 yards would, in the prevailing circumstances, be more realistic than 18·5 yards originally envisaged. The consequent reduction of 400 million yards was further expected to be reflected in the production by the handloom sector. The installation of 18,000 automatic looms for the purpose of exports also did not make any headway, partly because the export guarantees originally asked for by the Government appear to have been too severe and partly because the export demand was not buoyant, as indicated by the stagnation of actual exports of cloth around a level of 800 million yards throughout the Plan period. As against the more or less stagnant trend of production of mill cloth, the output of cloth by the decentralised sector has maintained a definite upward trend during the Second Plan period.

The production of yarn in the mill sector by broad count groups during the period under review has been as follows:

(In million lbs.)

	Counts		Above	Total
	1^s—20^s	21^s—40^s	40^s	
1955	917	617	96	1,630
1956	886	683	102	1,671
1957	967	723	90	1,780
1958	852	740	93	1,685
1959	841	771	111	1,723
1960	742	858	134	1,734

The production of cloth by mills, quality-wise, during the period under review has been as follows:

(million yards.)

	Coarse	Meduim	Fine	Superfine	Total
1955	572	3,759	462	301	5,094
1956	719	3,797	4,444	347	5,307
1957	1,164	3,503	383	267	5,317
1958	970	3,396	303	258	4,927
1959	892	3,500	242	291	4,925
1960	705	3,812	229	302	5,408

As production of cloth in the decentralised sector (comprising handlooms and powerlooms) is mainly based on residual supplies of mill yarn, after subtracting the yarn consumed for weaving cloth within the mill sector itself, a comparison of the above tables showing quality-wise production of yarn and of cloth by the mill sector also indicates the trends in quality-wise production by the decentralised sector. While there appears to have been some decline in the production of coarse cloth in the decentralised sector, the increase in production of medium cloth was mainly accounted for by this sector; and its production of fine and superfine cloth has gained at the expense of the mill sector.

Exports.—As against the export target of 1,000 million yards of cloth envisaged in the Plan, the actual exports during the period under review were as follows:

(million yds.)

	Mill made cloth	Handloom cloth	Total cloth
1955	815	60	875
1956	744	60	804
1957	844	37	881
1958	587	35	622
1959	815	36	851
1960	695	29	724

The low level of exports in 1958 was apparently due to the world-wide recession in that year as well as intensified foreign competition; while the low level in 1960 was mainly due to the short-fall in the cotton crop during the 1959-60 season (as the varieties of cloth exported require indigenous cotton to a large extent) and the consequent increase in internal prices of indigenous cotton and of cotton textiles. Throughout the Second Plan period, there was a wide margin of failure between targets and achievements on the export front, which is also partly due to growth of the cotton textile industry in countries hitherto dependent on imports.

Consumption.—As already pointed out, the Second Plan envisaged an increase in the per capita consumption of cloth to 18·4 yards from the estimated level of 16 yards in 1955-56. The per capita cloth consumption target was subsequently revised slightly to 18·5 yards in connection with the review of targets by Government as mentioned in page 584, and was subsequently reduced to 17·5 yards on the basis of the recommendations of the Joshi Committee (1958). The population figures which were used as the basis for calculating these per capita consumption figures are no longer valid in view of the fact that the population estimates both for the beginning and the end of the Second Plan period have been recently revised upward substantially, on the basis of the 1960 census results. On the basis of the latest population figures, the trends of per capita cloth consumption have been worked out as shown in the table below:

	Unit	1950-51	1955-56	1960-61
Estimated production (mid-fiscal year)	million yds.	360	391	434
Cloth production				
Mill-made	,,	3,718	5,101	5,084
Handloom and powerloom	,,	890	1,744	2,285
Khadi and Ambar	,,	7	29	74
Total cloth production	,,	4,615	6,874	7,443
Net exports of cloth	,,	1,284	739	720
Total availability (production minus net exports).	,,	3,331	6,135	6,723
Per capita availability of cloth	,,	9·3	15·7	15·6

Raw cotton.—As against the requirement of about 6·1 million bales of raw cotton for meeting the production target of 8,500 million yards of cloth envisaged in the Second Plan, a production target of 5·5 million bales of raw cotton was envisaged in the Plan under the Agriculture Sector. In November, 1956. the target was revised upward to 6·5 million bales of cotton. For increasing the output of raw cotton, the Plan envisaged continuation of the measures undertaken during the First Plan such as provision of hybrid seed, multiplication and distribution of improved seeds, grant of loans to cultivators for purchase of seed and fertilisers and extension of propaganda among the cotton cultivators. It was also proposed to place emphasis on increasing the production of long staple varieties, particularly in the areas brought under major irrigation projects. As against the forecasts thus made, the production of cotton increased from 4·5 million bales in 1955-56 to 5·4 million bales in 1960-61.

The following figures give the staple-wise production, imports and exports during the period:

(in lakh bales of 400 lbs. each)

	Long	Medium	Short	Total	Import	Export
1955-56	17·8	19·3	7·7	44·8	5·80	5·40
1956-57	20·2	19·5	7·9	47·6	6·10	2·40
1957-58	19·2	21·5	8·8	49·5	4·22	3·15
1958-59	17·6	22·6	7·8	48·0	4·75	3·98
1959-60	15·0	16·5	6·5	38·0	9·54	1·60
1960-61	24·9	22·7	7·4	54·0	10·00	2·90

As is evident from the above table, there was a considerable shortfall in the indigenous production of cotton during 1959-60; but this was offset by increased imports of foreign cotton, including imports of cotton of staple length below 1". The increase in indigenous production during the last year of the Plan has enabled stabilisation of the stock position and of the price level of indigenous cotton. The consumption of raw cotton by Indian mills has remained fairly steady between 50 to 52 lakh bales annually throughout the Second Plan.

Capital investment.—It has been estimated that, during the period under review an investment of about Rs. 45 crores has been made on expansion of capacity by the establishment of new units, substantial expansions and normal expansions. It is also estimated that an additional investment of about Rs. 75 crores was made on rehabilitation and modernisation programmes of the industry. The overall investment is placed between Rs. 115 crores and Rs. 125 crores or roughly at Rs. 120 crores.

Labour.—The average number of workers employed in the industry during each year of the period under review has been as follows:

Year	1955	1956	1957	1958	1959	1960
Number of Workers (in thousands).	758	807	813	767	763	772

II. Programme of Development in the Third Plan:

Estimated requirements.—On the basis of the estimated increase in population, and the likely increase in demand due to the expected rise in National income during the Third Plan, it has been assumed as a guide for planning the expansion of this industry over the next five years that the increase in the total requirements of cotton cloth during the Third Plan period will be of the order of 20%. Thus, the total requirements of cloth in 1965-66 have been taken as 8,450 million yards of cloth implying a per capita requirement of about 17·5 yards in 1965-66, on the basis of a mid-year population of about 486 millions expected at that time.

The export target for cotton cloth is envisaged at 850 million yards; most of which is expected to be accounted for by the mill sector. Taking the export and internal requirements together, the total demand for cloth at the end of the Third Plan has been placed at 9,300 million yards in 1965-66.

Target of spinning capacity.—For producing 9,300 million yards of cloth, the requirements of yarn are estimated at about 2,250 million pounds. To reach this level of production of yarn it has been envisaged in the Third Plan that 16·5 million active spindles will be required as against an average level of 12·7 million active spindles during the last year of the Second Plan. At the time of finalisation of the Third Plan, it was left for further consideration as to how much of the additional active spindleage required may be

secured by reactivation of currently idle spindles on the one hand and how much of additional spindleage will have to be installed in new units or by way of substantial expansions, on the other.

Subsequent to the finalisation of the Third Plan an official group, which examined comprehensively all aspects of the installation of additional spindleage during the Third Plan, submitted its report, which is referred to in more detail in the section below. On the basis of this report, it is expected that about 5 or 6 lakh idle spindles are likely to be reactivated during the Third Plan. It is further envisaged that the installation of about 3·3 million additional spindles will be required under new units and expansion of existing mills to reach the target of 16·5 million active spindles laid down in the plan.

Pattern of allocation of additional spinning capacity.—Cotton textiles is one of the major consumer goods industries which lends itself to a large measure of dispersal. Therefore from the point of view of promoting the growth of industries in the different parts of the country, state-wise allocation of the new spindles proposed to be installed under the Third Plan assumes considerable importance. At the same time, it is necessary, in an essential item like cotton yarn linked with the production of cloth, an essential necessity of the entire population, that this spindleage should be planned to be established in units of optimum size. An official group, which went comprehensively into all aspects of the installation of the additional spindleage during 1961-66, expressed its views as outlined below:

(a) In relation to future planning, only the active spindles should be taken into account to fix the starting point for the Third Plan and the balance of installed spindleage written off for the purpose of reckoning the production potential.

(b) According to the latest data available about 1 to 1·28 million spindles were modernised in the existing textile mills during the Second Plan period. With such support as would be available from the National Industrial Development Corporation within the allocation of resources made for this agency to assist the cotton and jute textile industries, it would not be feasible to renovate more than about 3 lakh spindles. Inclusive of other mills carrying out renovations independently on their own—these will not be many since flourishing mills have carried out extensive renovations already—the overall replacements may be about 5 to 6 lakhs in the Third Plan period. Reckoning additional output equivalent at the most to one more shift from such renovations, the additional yarn production could be placed at about 45 million pounds per year.

(c) The yarn target for the Third Plan, as already explained, is 2,250 million pounds by 1965-66. After allowing for additional production from renovations, the balance of output to be planned through the expansion of spindleage might roughly be placed at 2,200 million pounds in the final year of the Plan. Though achievement of higher output per spindle is desirable, capacity planning has to err on the safe side to ensure the desired output even if the industry

operated on current norms. Based on this approach and broadly assuming the relationship between the active spindleage and the yarn output of the year 1960 for future planning, the spindleage requirements for achieving the output of 2,200 million pounds in 1965-66 are placed at 16 million Nos. The new active spindleage to be installed thus works out to 3·3 million Nos. Allowing for some infructuousness as well as spillover of uninstalled spindles into the first year of the Fourth Plan, the number to be licenced in the Third Plan period could be taken at 4 million spindles.

(d) Out of the new spindleage recommended to be licensed about 6·8 lakhs spindles might be reserved for building up new capacity in lieu of mills scrapped or compulsorily closed in accordance with the accepted policy of the Government that new mills should be installed in those very States. In allocating the balance of capacity, consideration has to be given to (i) expansion of existing mills and (ii) installation of new capacity on a regional basis taking all relevant factors into account. The allocation as between these two heads of the additional capacity to be licensed including the capacity reserved for replacement of scrapped units is suggested as in paras (e) and (f) below:

(e) For expansion of existing mills about 1 million spindles should be ear-marked under the Third Plan. The minimum economic size of every spinning (or composite) mill should be maintained at 12,000 spindles under the Third Plan as the absolute minimum and wherever possible and necessary, the minimum size should be further stepped up to 18,000 spindles and ultimately to 25,000 spindles.

(f) After allocating one million spindles for expansion a balance of 3 million spindles would be left for allocation to the new textile mills to be established. Out of this total, about 2 million spindles might be licensed with reference to the first half or the first three years of the Third Plan period and the position reviewed by about the middle of 1963.

(g) A careful study was made of the various aspects bearing on the scope for and limitations to the dispersal of the industry on a State-wise basis giving due weight to the various relevant factors *e.g.* population, current production of yarn and cloth, existing distinction of spindleage, concentration of handlooms and the overall needs of the decentralised sector. Based on this study, the state-wise allocation of the spindleage to be visualised for licensing to new units as the first phase of development of the cotton textile industry should be as under:

	State	Suggested allocation ('000 spindles)
Category I	Andhra	225
	Bihar	225
	U. P.	225

	State	Suggested allocation ('000 spindles)
Category II	Assam	150
	Madhya Pradesh	150
	Kerala	150
	Orissa	150
	Punjab	150
	Rajasthan	150
Category III	Mysore	100
	West Bengal	100
Category IV	Gujarat	75
	Maharashtra	75
	Madras	75
Category V	Manipur & Tripura	50
	TOTAL	2,050

(h) The establishment of new mills should be visualised on the basis of 25,000 spindles though it should be open to entrepreneurs to spread the process of development into two equal phases to be completed in the Third Plan period for financial, foreign exchange and other relevant considerations.

(i) If the capacity allocated to a particular State is not utilised fully for bringing the new units into existence, in making good the shortage of installed capacity preference should be given to applications for expansion of existing mills in the same State in the first instance and thereafter to applications for expansion of capacity in the neighbouring States.

The recommendations of the Group which are accepted by Government provide the broad framework for guiding the future growth on the spinning side of the cotton textile industry in the Third Plan.

Pattern of cloth production and weaving capacity.—Out of the over-all cloth production of 9,300 million yards visualised for 1965-66 the allocations proposed for the organised mill sector and the decentralised sector are 5,800 million yards and 3,500 million yards respectively.

The present rated capacity of the mill sector for cloth production is estimated at about 5,000 million yards on the basis of an average double shift operation of the 198,185 looms installed. For producing an additional 800 million yards of cloth it is estimated that about 25,000 additional looms will be required. In the interests of efficiency it is envisaged that all new looms to be installed should be automatic. Against the background of the export target for cotton textiles and the stiff competition to be reckoned with in export markets, it is proposed that a substantial proportion of the additional loomage shall be export-oriented.

Rehabilitation and Modernisation:

The Working Group set up by the National Industrial Development Corporation examined the requirements of the Cotton Textile Industry for rehabilitation and modernisation during the Third Plan, and submitted its report in 1960. It made a broad estimate that an expenditure of about Rs. 143 crores on rehabilitation and modernisation would be required during the Third Plan period. Taking into account also the estimated requirements for expansion of capacity, the Working Group placed the total gross investment needs of the Cotton textile industry during the Third Plan at about Rs. 180 crores.

Out of this gross requirement the contribution of the industry drawn from its internal resources, from commercial banks and non-institutional sources of finance was placed at Rs. 80 crores. The Working Group suggested that the balance of the financial requirements of the industry, amounting to about Rs. 100 crores, should be provided by financial institutions such as the National Industrial Development Corporation and Industrial Finance Corporation. In the physical plan for industrial programmes under the Third Plan—this is not matched by full allocation of financial resources—the provision of Rs. 20 crores made for the various programmes of the National Industrial Development Corporation falls very much short of the Governmental assistance recommended by the Working Group for the modernisation and expansion of the textile industry. The implications of this shortfall in financial assistance for the cotton textile industry were reviewed after the publication of the Third Five Year Plan and, as explained in the preceding section, a large share of the growth requirements is proposed to be secured through expansion of existing uneconomic units and establishment of new units.

Investment and employment.—The installation of about 3·8 million spindles (0·5 million spindles through modernisation and 3·3 million as new spindleage) and 25,000 automatic looms envisaged in the Third Plan is estimated to require a fixed investment of about Rs. 130 to 140 crores.

Taking into account the production targets envisaged for the industry as well as the impact of modernisation programmes on productivity per worker, the industry is likely to provide additional employment to about 70,000 persons by the end of the Third Plan.

Raw cotton requirements.—About 6·6 million bales of raw cotton will be required to produce 2,250 million lbs. of yarn. As against an estimated production of 5·1 million bales in 1960-61, a production target of 7·0 million bales of cotton has been envisaged under the agricultural sector in the Third Plan. The measures envisaged for achieving this target involve, in the main, expansion and intensification of the programmes already adopted during the Second Plan, including special emphasis on production of long staple cotton with a view to replacing imported cotton. One special feature envisaged in the Third Plan is an effort to step up production of Sea Island cotton (extra-long staple cotton) in Mysore and Kerala. The acreage under Sea Island cotton is proposed to be extended from about 20,000 acres to about 300,000 acres during the Third Plan.

The development programme for the cotton textile industry in the Third Plan is summarised below:

Rated capaicty of mill industry (end of period)	Unit	1960	1965
Active spindles	million	12·7	16·5
Looms	'000	199	225
Production			
Yarn	million lbs.	1,737	2,250
Mill cloth	million yds.	5,048	5,800
Handloom, powerloom, ambar and khadi cloth	,,	2,269	3,500
Cloth exports	,,	695	850
Per capita consumption	yds.	15·6	17·4
Raw cotton requirements	million bales	5·1	6·6

ANNEXURE

Regionwise installed capacity of the Cotton Textile Industry as on January 1, 1956 and January 1, 1961

Region	As on January 1, 1956				As on January 1, 1961				Increase/decrease(—) during 1956-61	
	Number of spinning mills	Number of composite mills	Spindleage	Loomage	Number of spinning mills	Number of composite mills	Spindleage	Loomage	Spindleage	Loomage
Maharashtra—										
Bombay City	5	58	3,105,448	65,183	6	56	3,245,286	63,054	139,838	—2,129
Rest of Maharashtra	5	25	893,178	18,527	6	24	911,020	18,107	17,842	—420
Gujarat—										
Ahmedabad City	4	63	2,036,408	41,642	5	61	2,092,540	41,639	56,132	—3
Rest of Gujarat	7	31	786,878	14,727	9	28	807,438	13,998	20,560	—729
Madras	58	24	2,171,276	8,016	109	25	3,141,844	7,346	970,568	—670
Pondicherry	..	3	81,124	2,089	—	3	79,428	2,116	—1,696	27
Uttar Pradesh	6	17	770,792	13,590	8	17	836,112	13,509	65,320	—81
West Bengal	10	17	507,429	9,115	14	18	644,794	9,135	137,365	20
Madhya Pradesh	1	18	511,346	12,911	1	17	497,620	12,362	—13,726	—549
Mysore	4	10	395,054	4,529	7	10	450,456	4,637	55,402	108
Kerala	9	4	181,400	1,224	8	5	208,268	1,397	26,868	173
Andhra Pradesh	7	3	132,892	1,457	11	2	204,480	1,228	71,588	—229
Rajasthan	2	9	162,380	3,457	2	8	152,000	3,011	—10,380	—446
Delhi	..	3	156,532	3,442	..	4	168,968	3,728	12,436	286
Punjab	2	3	79,132	1,383	4	4	130,310	1,911	51,178	528
Orissa	1	1	51,472	864	2	1	59,216	864	7,744	Nil
Bihar	..	2	28,468	745	..	3	33,584	743	5,116	—2
TOTAL	121	291	12,051,209	202,901	192	286	13,663,364	198,785	1,612,155	—4,116

64. JUTE TEXTILES

I. Review of Progress in the Second Plan:

Targets.—The programme of development of the jute textile industry in the Second Plan did not envisage the establishment of any additional capacity except the installation of a new 300 loom mill in Assam. Only a small increase in production was planned, to reach a level of 1,200,000 tons a year, equivalent to the industry's single shift capacity. It was visualised that exports would improve from 875,000 tons a year to 900,000 tons by the end of the Second Plan.

The plan also provided for stepping up the indigenous production of raw jute from 4·1 to 5·5 million bales a year, which, taken together with the existing level of mesta production, would be sufficient to meet the raw material requirements of the industry at the planned level of production.

Capacity and production of jute goods.—The earlier scheme for a 300 loom mill licensed in Assam not having materialised, fresh licences were issued in 1960-61, for two 150 loom mills, one in the co-operative sector and the other in the private sector. Two small units have been licensed in Andhra for making twine and one in West Bengal for making a special type of webbing.

The number of looms installed in the Indian jute industry has varied as below:

	Hessian and Sacking looms	Other looms	Total looms
1955	68,657	3,501	72,158
1958	68,953	3,830	72,783
1960	69,044	3,081	72,125

The increase is due to the installation of broad looms for the production of wide hessian used as carpet backing in the U.S.A. The decrease in "other looms" has been caused by the scrapping of webbing looms, consequent on a sharp decline in the demand for this narrow-width fabric in world markets. It is estimated that the installed capacity of the jute industry at the end of the Second Plan would be about 1,200,000 tons per annum, based on single-shift working.

The actual production of jute manufactures of mills in the membership of the Indian Jute Mills Association and 3 non-member mills in the period under review was:

(in '000 metric tons)

	Hessian	Sacking	Other manufactures	Total
1956-57	435·2	535·3	71·2	1,041·7
1957-58	398·2	606·2	68·8	1,073·2
1958-59	453·4	517·8	85·9	1,057·1
1959-60	456·5	539·3	95·7	1,091·5
1960-61	371·9	532·7	1,17·9	1,022·5

Variations in the level of production are attributable partly to fluctuations in the world demand for jute goods (internal demand, accounting for a fifth of the output, grew steadily) and partly to raw material availability.

Diversification of production.—The following table gives item-wise production of jute goods other than hessian and sacking during the Second Plan period. This indicates the extent to which the industry has tried to diversify its production.

(in metric tons)

Item	1956-57	1957-58	1958-59	1959-60	1960-61
Carpet backing cloth . .	6,096	8,137	20,424	30,220	38,529
Twine	23,918	31,580	37,352	20,760	26,804
Canvas	3,078	3,490	3,540	5,875	13,940
Pack sheets . . .	8,527	8,656	8,582	8,586	7,700
Carpets	1,383	1,233	1,787	2,094	1,637
Others	5,295	4,559	6,285	5,948	4,612

Among the above items carpet backing cloth deserves special mention. It is used as a base cloth for tufted carpets and is mostly exported to the U.S.A. The capacity for production of this type of cloth is still being expanded, though more slowly than before.

The utilisation of capacity in member mills of the Indian Jute Mills Association, during the period under review has been as follows:

Period		Percentage of sealed looms,		Hours per week
From	To	Compulsory	Voluntary	
1-4-1956 .	15-7-1956	5	..	48
16-7-1956 .	16-9-1956	7½	..	48
17-9-1956 .	1-3-1959	12½	..	48
2-3-1959 .	21-6-1959	14	..	48
22-6-1959	23-8-1959	12½	..	48
24-8-1959 .	30-4-1960	10	..	48
1-5-1960 .	5-6-1960	9	..	48
6-6-1960 .	15-10-1960	9	Between 2 & 3½	48
16-10-1960 .	22-10-1960	9	5	48
23-10-1960 .	31-10-1960	9	10	48
1-11-1960 .	22-11-1960	19	..	48
23-11-1960 .	25-12-1960	17	..	48
26-12-1960 .	29-1-1961	12	..	45
30-1-1961 .	31-3-1961	12	..	42½

Exports.—Exports of jute manufactures and foreign exchange earnings in the same period were as follows:

(in '000 metric tons)

	Hessian	Sacking	Others	Total	Value (Rs. crores)
1956-57	433	424	52	909	119
1957-58	406	395	62	863	112
1958-59	433	326	46	805	102
1959-60	454	356	60	870	112
1960-61	420	306	76	802	135

The fall in exports in 1957-58, and even more in 1958-59, was due to a world wide trade depression. The prices of jute and jute goods also slumped to uneconomic levels at the end of 1958. Export demand began to recover in 1959, but unfortunately the price of raw jute rose to very high levels in 1960, on account of anticipated jute shortage. Prices of jute and jute goods remained at these high levels in 1960 and the first half of 1961, and the production of jute goods had to be considerably curtailed when a jute shortage became evident. The export demand was affected by high prices, resulting in the sharp decline in exports in 1960-61 below the previous years' level although export earnings rose by Rs. 23 crores.

Raw material supply.—The actual production of jute and mesta in India in the Second Plan period was as below:

Crop years (July—June)	Raw Jute		Mesta		Total of jute and mesta	
	Area ('000 hectares)	Production ('000 bales)	Area ('000 hectares)	Production ('000 bales)	Area ('000 hectares)	Production ('000 bales)
1956-57 .	772	4,289	297	1,478	1,069	5,767
1957-58 .	705	4,052	309	1,291	1,014	5,343
1958-59 .	733	5,158	334	1,488	1,067	6,646
1959-60 .	682	4,605	285	1,118	967	5,723
1960-61 .	619	4,030	281	1,147	900	5,177

The plan target of 55 lakh bales of raw jute was not achieved, although in 1958-59 India for the first time since partition achieved quantitative self-sufficiency in fibre supply for the jute industry. The acreage under both jute and mesta fell sharply in 1959-60 on account of low fibre prices in 1958-59. In the next season (1960-61) there was a drought in the jute growing areas in the sowing season, so that there was a further drop in both acreage and yield although the fibre prices were ruling fairly high. The successive crops in 1959-60 and 1960-61 which fell short of the industry's raw material demand, accompanied by similar short crop in Pakistan, caused the worst crisis in the jute industry in ten years.

In the Second Plan period on the average only 5·5 lakh bales of jute (mainly low-cost jute cuttings) were imported annually, as against nearly 15 lakh bales in the last year of the First Plan:

(July—June)	Imports from Pakistan ('000 bales)
1956-57	646
1957-58	695
1958-59	340
1959-60	614
1960-61	413

From the surplus in the 1958-59 season 2 lakh bales were exported from India during 1959-60, the first exports since partition.

Price trends.—Prices of jute and jute goods continued to be extremely unstable in the period under review, *vide* table below:

(July—June)	Jute Assam Bottom (per quintal)			Hessian 40" × 10 oz. (per 100 metres)			Sacking B. Twill (per 100 bags)		
	Min Rs. nP.	Max. Rs. nP.	Average Rs. nP.	Min. Rs. nP.	Max. Rs. nP.	Average Rs. nP.	Min. Rs. nP.	Max. Rs. nP.	Average Rs. nP.
1956-57	72·34	91·09	80·12	41·66	53·03	46·60	102·60	133 79	125·00
1957-58	60·12	85·74	72·56	41·20	47·56	44·65	94·00	121·40	107·27
1958-59	53·58	75·01	60·61	42·00	48·65	45·03	87·85	100·60	94·84
1959-60	57·60	150·04	81·44	43·09	60·15	46·74	96·45	146·00	112·70
1960-61	89·75	178·17	135·21	47·51	76·15	60·68	122·55	215·50	167·97

In 1958-59 for some months the prices of jute goods were supported by a gentlemen's agreement among members of the Indian Jute Mills Association. Subsequently production was curtailed. Later, attempts were made to support the price of raw jute by increased mill purchases, by the intervention of the State Trading Corporation in the jute market and by exporting surplus jute. From early 1960, on the other hand, a series of steps had to be taken to counter the continuing rise in jute and jute goods prices well above desirable levels. These measures included the voluntary regulation of jute purchases, periodic adjustments of jute goods, production of conserve jute supplies, restrictions on forward trading and curbs on bank advances against jute and jute goods. A Statutory Jute and Jute Goods (Licensing and Control) Order was issued early in 1961. By the third quarter of 1961, however, prices were returning to more normal levels.

Modernisation of the jute industry.—By the end of the Second Plan period the modernisation of the Indian jute industry up to the spinning stage had been virtually completed. By the 31st March 1961, 293,970 spindles were supplying sliver-spun yarn (in 59 out of 82 mill companies) equivalent to 84% of the spinning capacity needed to match the single shift output of the working looms.

The total investment on modernisation has been estimated at Rs. 30 crores, the bulk of it having been invested in the Second Plan period. This included the utilisation of Rs. 4·5 crores of loans from the National Industrial Development Corporation, which had altogether sanctioned Rs. 6 crores to 27 mill companies.

According to the Census of Indian Manufactures the total investment in the industry in 1955 (before the Second Plan) had been Rs. 71·5 crores comprising fixed capital of Rs. 36·9 crores and working capital of Rs. 34·6 crores. At the end of 1958 the total investment in the industry was Rs. 78·3 crores, comprising fixed capital of Rs. 40·2 crores and working capital of Rs. 38·1 crores.

Rationalisation.—In the period under review a few uneconomic units of the industry, comprising 4,183 registered looms, were closed down. The loom-hours were transferred to other units, which were thus enabled to work their looms partly on double shift. The system of one operator for two looms was extended in this period to about 16,000 looms. By these measures, and on account of the introduction of modern machinery, the labour strength of the jute mills has been progressively reduced.

II. Programme of Development in the Third Plan:

Internal consumption of jute goods.—It is necessary to assess separately the trends of export demand and of internal demand for jute goods, to estimate the likely requirement of these goods in the Third Plan period. The annual internal consumption of jute goods for packing in 1960-61 is estimated at about 270,000 tons. In the Third Plan, in view of the large increase that is envisaged in the output of agricultural commodities and other packageable commodities, notably cement and fertilisers, it is estimated that the internal demand for jute goods will increase by 150,000 tons, reaching a level of about 400,000 tons in 1965-66.

Trend of export demand.—The demand for jute goods in world markets may be considered broadly under three heads: (i) packaging (ii) floor-coverings (iii) other industrial uses. In the field of packaging, which is still by far the most important end-use, the trend of demand depends on two factors, *viz.*:

(a) the output of "packageable" commodities *e.g.* foodgrains, potatoes, sugar, cocoa, wool, cotton, cement, fertilisers, etc.;

(b) the jute utilisation factor *i.e.*, the ratio between the consumption of jute manufactures and the output of packageable commodities.

While the output of packageable commodities has increased rapidly in most countries, the jute utilisation factor has in recent decades shown a marked downward trend, especially in the U.S.A. and Western Europe, so that the total world consumption of jute manufacture has remained more or less stagnant. The decline in use of jute packing material has been due to its displacement by bulk-handling methods, the increased use of substitute materials, especially paper bags, and changes in distribution methods to direct consumer-side retail packing. The instability of jute goods prices has also weakened their competitive position and facilitated substitution.

So far as floor coverings are concerned, however, there is a generally rising trend of consumption, particularly in the use of tufted carpets with jute backing and linoleum. On the other hand, the consumption of jute in the form of rope and twine, roofing felts, webbing, upholstery, etc. has not shown any increase in recent years and face severe competition from synthetics. In a recent study of the trends in world demand for jute manufactures, the Food and Agriculture Organisation of the United Nations has come to the conclusion that while the overall demand for jute packing materials will remain more or less stagnant in the next decade, a moderate increase in the demand for jute floor coverings may be expected.

The existing and potential markets for India's jute manufactures are (i) U.S.A. and Canada, (ii) Latin America, (iii) Australia and New Zealand, (iv) U.K. and Western Europe, (v) U.S.S.R. and Eastern Europe, (vi) South East Asia, the Middle East and Africa. Due to the shift from jute bags to bulk handling, paper bags and consumer-size packaging in the U.S.A., it is difficult to envisage any appreciable increase in the export of jute manufactures to the U.S.A. Except for wide hessian for carpet backing, it does not seem that any significant rise in U.S. and Canadian burlap (hessian) consumption can be anticipated. On the other hand with both increased agricultural output and greater industrialisation anticipated in all the major Latin American countries, increased exports of jute manufactures to these areas may be expected. In Australia, India's biggest market for sacking, bulk handling has made considerable progress in the grain trade. In addition India has to face competition in the market from Pakistan's growing jute industry.

U.K. has long been the largest single market in Europe for Indian jute goods. However, the U.K. "Mark-up" on the price of Indian hessian has gravely affected the competitive position of hessian in relation to substitutes. Western European markets are protected by tariffs around 20% *ad valorem* and also by import quotas. The development of exports of jute goods to Western Europe will depend largely on the nature of policies adopted by the European Common Market and by the U.K.'s trade policies after membership of this market. In the trade with the U.S.S.R. and Eastern Europe on the basis of bilateral agreements which has developed during the Second Plan period, jute goods exports have played a significant part. U.S.S.R. is one of India's important customers of jute goods and a further increase may be expected.

Potentially the greatest increase in jute goods consumption in the next decade should be in the developing countries of Asia and Africa. While the consumption of sacking in these countries will undoubtedly increase, the scope for increasing exports from India would be governed partly by the desire of some of these countries to set up their own jute mills and partly by the competitive ability of Indian jute goods in comparison with those from Pakistan.

Among measures which are under consideration for stimulating exports are the adoption of statistical quality control methods on a large scale in the industry, formulation of I.S.I. standards for jute goods, greater facilities for pre-shipment inspection, and a scheme for the registration of exporters. The National Productivity Council has also undertaken technical studies designed to increase productivity in all sectors of the industry, to reduce costs and thus improve the competitive position of Indian jute goods in world markets.

Target for jute goods production.—If the internal demand for jute goods rises by 150,000 tons to reach a level of about 400,000 tons by the end of the Third Plan, and the level of exports is maintained or increased only marginally to about 900,000 tons a year, the level of production at the end of the plan period should be about 1·3 million tons a year. This can be achieved by progressive unsealing of looms of member mills of the I.J.M.A., and by working a marginal portion of the installed loomage on double shift if necessary.

To match the increased production of jute goods with supply of sliver-spun yarn, the modernisation of the remaining 16% of the industry's spinning capacity should be completed.

Further modernisation.—In the Third Plan the Indian Jute Industry is expected to take up the modernisation of its equipment for the post-spinning stages. Old winding equipment is expected to be largely replaced by new high-speed machines, and additional pre-beaming equipment will be installed to increase productive efficiency. For the modernisation of the weaving process, the choice would be between (a) rendering the existing flat-bed looms semi-automatic by the use of cop-changers and warp-stop-motions, (b) replacement by automatic circular looms, and (c) replacement by automatic shuttle-less looms. The leading mill-groups have for some time now been experimenting with these three methods of loom automatisation, and by early 1962 are expected to be in a position to draw up their modernisation programmes. The phasing of the programme, to be determined in consultation with Government, will depend on the availability of foreign exchange, the indigenous output of modern jute mill machinery and the probable impact of loom automatisation on employment.

The requirement of foreign exchange for machinery imports till a complete range and adequate level of indigenous production is attained, and for imports of spare parts and stores whose manufacture in India would not be economical, is estimated at Rs. 6·5 crores only for the Third Plan period. The estimated total investment in the jute industry in the Third Plan period will be of the order of about Rs. 12 crores, towards which the National Industrial Development Corporation may have to contribute to the extent of a few crores of rupees by way of loans.

Targets for jute and mesta production.—The Third Plan target for jute and mesta production together is 75 lakhs bales *per annum*. As against this, the requirements of raw jute for reaching the production targets of 1·3 million tons of jute goods in the organised sector are estimated at 75 lakh bales. In addition, the consumption of jute by village & small-scale industries is estimated at 2 lakh bales *per annum*. It is envisaged that about 5 to 6 lakh bales of relatively low-cost jute cuttings may be imported from Pakistan and possibly from Thailand in order to keep down the raw material costs for the industry. Accordingly, there may be a small surplus of indigenous jute for export, though the requirements for building up an adequate buffer stock of jute (see below) will first have to be provided for. The measures proposed under the agricultural sector in the Third Plan for achieving the production target for raw jute include *inter alia* improvement in quality through supply of high quality seed and through provision of retting tanks.

An essential part of the programmes of jute development, jute goods production and export promotion is to solve the problem of price-stabilisation. An important step in this direction has been taken in the decision to establish a Buffer Stock Agency for raw jute. By regulated mill purchases, flexible goods production, Buffer stock operations when required, strict enforcement of various curbs on speculative trading in jute and jute goods, and other related measures, it is hoped that fluctuations in the prices of both jute and jute goods will be kept within reasonable limits. The stability of jute prices at remunerative levels will promote a stable pattern of jute production, which, together with the buffer stock to tide over shortages in bad seasons, will, it is hoped, enable the jute industry to increase its production steadily in the Third Plan period so as to reach the target set.

The development programme of the jute industry as envisaged in the Third Plan is summarised below :

	Unit	1960-61	1965-66
Production of jute manufactures	'000 metric tons	1,022	1,300
Raw Jute and Mesta production	lakh bales	51·8	75

65. RAYON, SYNTHETIC FIBRES AND CELLULOSE FILM

A. Rayon and Synthetic Fibres

I. Review of Progress in the Second Plan :

Targets

(i) *Rayon filament.*—The Development Council for the art silk industry had estimated that the demand would be 80 million lbs. *per annum* in 1960-61. As against this estimated demand, the Planning Commission recommended a provisional target of 68 million lbs. In suggesting a somewhat reduced target as compared to requirements, the considerations that were taken into account were explained in page 366 of the Programmes of Industrial Development, 1956-61 as reproduced below:

> "In considering any further expansion in this industry due account has to be taken of such factors as the dependence of the industry on imported raw materials, the capital intensive character of the industry and the comparatively low priority it enjoys in the schemes of development envisaged during the Second Plan. While in the case of essential industries development can be envisaged to the point of self-sufficiency, in the case of rayon industry which primarily caters to the requirements of a limited section of the population, it is doubtful whether a high priority can be attached to further expansion during the Second Plan and diversion thereto permitted of resources which might be better employed elsewhere. *Prima facie* such a course might be justified if it gives a stimulus to ancillary industrial development and the exploitation of raw material available within the country; but not if it accentuates the strain on foreign exchange by requiring the imports of raw materials. In the light of these considerations it would seem that further expansion of capacity in the manufacture of rayon filament should be in terms of cellulose acetate filament, since the two primary raw materials namely cotton linters and alcohol are available within the country and its manufacture would give a stimulus to their production....."

Subsequently in October 1956, at the request of the Ministry of Commerce and Industry, the Planning Commission reviewed the provisional target and agreed to consider favourably schemes for further expansion of the rayon filament industry including synthetic fibres like nylon upto a limit of 100 million lbs., provided satisfactory arrangements would be made by the prospective entrepreneurs to import at least 80% of the capital equipment on deferred payment terms. However, with the worsening of the foreign exchange position it was not possible to release the necessary foreign exchange for the rayon industry and even the original target of 68·3 million lbs. could not be reached by 1960-61.

(ii) *Staple fibre.*—Although the demand for stable fibre was estimated to increase to about 35 to 40 million lbs. by 1960-61, a production target of 32 million lbs. only was envisaged for the same reasons as in the case of rayon filament. It was expected that the capacity of the industry would increase to 32 million lbs. with the completion of the expansion programme of M/s. Gwalior Rayon Silk Mfg. (Weaving) Co. This was recommended as the capacity target for 1960-61.

As against the targets indicated above, the capacity, production and consumption levels estimated to have been reached by the end of the Plan period in these two sectors of the industry are set forth in the following paragraphs :

(i) *Rayon filament*

Capacity.—At the beginning of the Second Plan *viz.*, in April 1956 there were three units in the country manufacturing rayon filament with an annual capacity of 22·3 million lbs. Since then, three new units with a combined capacity of about 21·6 million lbs. have gone into production. Two of the existing units have expanded their capacity leading to an increase in capacity by about 8·4 million lbs. Details of these new units and expansions are given below:

Schemes completed during April, 1956 to March, 1961

(million lbs.)

Name of the Unit	Nature of Scheme	Annual capacity as on 1-4-1956	Annual capacity as on 1-4-1961	Increase in capacity
M/s. Century Rayons, (Bombay)	New Unit	..	9·6	9·6
M/s. J.K. Rayons Corporation, Kanpur	Do.	..	4·0	4·0
M/s. Kesoram Cotton Mills, Calcutta	Do.	..	8·0	8·0
M/s. National Rayons Corporation, Bombay	Expansion	12·7	19·5	6·8
M/s. Travancore Rayons, Rayonpuram (Kerala)	Do.	5·6	7·2	1·6
		TOTAL increase		30·0

As a result of the implementation of the above schemes the annual capacity of the rayon filament industry stood at 52·3 million lbs. on 1st April, 1961, as against the target of 68·3 million lbs. envisaged for 1960-61. Of the existing capacity, capacity for the manufacture of viscose filament amounted to 48·3 million lbs. and that for cellulose acetate filament to 4 million lbs.

Consumption.—The consumption of rayon filament on the basis of production plus imports in the year 1955-56 and during the Second Plan is estimated as under:

(million lbs.)

	Production	Imports	Availability
1955-56	16·0	50·7	66·7
1956-57	21·3	61·8	83·1
1957-58	26·6	40·9	67·5
1958-59	35·0	44·5	79·5
1959-60	38·0	39·7	77·7
1960-61 (Estimated)	47·0	32·0	79·0

It will be observed that during the Second Plan, except for the year 1956-57 the availability of filament was less than 80 million lbs. The larger availability in 1956-57 is explained by the comparatively heavy imports in that year which were the result of the liberal import policy that was in force in 1956. Thereafter, when restrictions were imposed on imports, both imports and consumption have fallen. The larger availability of rayon filament in 1956-57 may not however be a true indicator of the requirements or consumption of rayon filament in that year since it is likely that some of the imports were carried forward to the next year. At current prices and taxation levels, the consumption of rayon filament can be assessed at about 80 million lbs.

(ii) *Staple fibre*

Capacity.—At the commencement of the Second Plan, M/s. Gwalior Rayon Silk Manufacturing (Weaving) Company was the only factory producing staple fibre. Its plant at Nagda had a capacity of 16 million lbs. *per annum* at that time. Since then, the firm has expanded is capacity to 48 million lbs. *per annum* thereby exceeding the target capacity of 32 million lbs.

Consamption.—The consumption of staple fibre during the Second Plan period is indicated in the following table:

(million lbs.)

	Production	Imports	Availability
1956-57	18·2	41·3	59·5
1957-58	19·3	15·5	34·8
1958-59	35·3	0·1	35·4
1959-60	44·8	0·3	45·1
1960-61 (Estimated)	48·0	..	48·0

It will be seen that the availability of staple fibre declined from about 60 million lbs. in 1956-57 to about 35 million lbs. in the two subsequent years and has thereafter shown an increase to 48 million lbs. in 1960-61. The liberal import policy adopted in 1955-56, accounts for the large imports in 1956-57. The restriction which came into force early in 1957 reduced the imports from 1958 onwards to negligible quantities, but owing to the increase in indigenous production, the availability of staple fibre has been rising again in the last three years and until recently there has been no serious complaint of any shortage. Since staple fibre is partly a substitute for long staple cotton, the demand for it fluctuates and is dependent on the price and availability of long staple cotton. The failure of the cotton crop and the resulting shortage in long staple cotton seem to have led to pressure on the supplier of staple fibre in 1960-61 leading to complaints of shortage and high prices.

Investment and foreign exchange.—About Rs. 35 crores are estimated to have been invested in the rayon and synthetic fibre industry during the Second Plan period. The foreign exchange component of this investment is placed at about Rs. 25 crores.

Major development in the industry.—In 1958, the Government of India requested the Tariff Commission (i) to enquire into the fair works price and fair selling price of acetate yarn manufactured by M/s. Sirsilk Ltd. and (ii) to make recommendations regarding fair prices to be charged by wholesalers and retailers of acetate yarn after calculating suitable margins for commission in respect of sales and distribution. The Tariff Commission accordingly examined the cost of production of acetate yarn produced by M/s. Sirsilk Ltd. and submitted its report in April 1959. The main recommendations of the Commission regarding increase in the prices of acetate yarn have been accepted by the Government.

II. Programme of Development in the Third Five Year Plan:

Estimated requirements, capacity and production.—As the main use of rayon filament, staple fibre, nylon yarn and other synthetic fibres is in the art silk weaving industry, the demand for these during the Third Plan period has to be assessed in the light of the production envisaged for art silk cloth. In addition, account has to be taken of the demand for rayon yarn arising from other miscellaneous uses. These are discussed in the following paragraphs.

(i) *Art silk weaving industry.*—The Tariff Commission in their report (1958) on "continuance of protection to the art silk industry" has estimated the capacity of the weaving industry in terms of powerlooms, at 71,008 composed of the following:

	Number of looms
Registered powerlooms	44,500
Cotton textile mill looms	908
Handlooms (in terms of powerlooms)—	
Art silk	11,300
Mixed fabrics	6,300
Unregistered	8,000

The capacity of an average powerloom has been assessed by the Tariff Commission at 22 yds. of cloth per shift. On this basis and assuming 300 working days in a year the capacity of the art silk weaving industry on single shift works out to about 470 million yards.

The production of art silk fabrics during the Second Plan period as reported to the Textile Commissioner has been as follows:

	Production (million yards)
1955-56	251·18
1956-57	296·11
1957-58	278·39
1958-59	310·87
1959-60	330·00
1960-61 (Estimated)	350·00

However since all the art silk weaving mills do not send their returns to the Textile Commissioner and further, there is a certain amount of production in the decentralised sector for which statistics are not readily available, it would be perhaps more appropriate to calculate the production of art silk fabrics on the basis of the availability of rayon filament and staple fibre. In making these calculations it has been assumed that 85% of the total availability of rayon filament and the entire indigenous production of staple fibre, excepting 1 million lbs. per annum required by the cotton textile mill industry, is used for the production of art silk cloth. On this basis the production of art silk cloth has been as given below:

	Production (million yards)
1955-56	430
1956-57	564
1957-58	470
1958-59	520
1959-60	550
1960-61 (Estimated)	570

It will be seen that except in the year 1956-57 in which the production as estimated appears abnormally high because of heavy imports of filament and staple fibre during that year, there is a steady increasing trend in production. Taking into account imports and exports of art silk fabrics also, the *per capita* consumption has also similarly shown a steady but modest increase as given in the table below:

	Production	Imports*	Exports*	Re-export*	Consumption	*Per capita* Consumption (Yds.)
		(Million yds.)				
1955-56	430·0	10·0	3·0	..	437·0	1·14
1956-57	564·0	7·5	3·5	..	568·0	1·45
1957-58	470·0	3·6	2·8	0·2	470·6	1·18
1958-59	520·0	4·9	26·3	8·6	490·0	1·20
1959-60	550·0	9·2	19·5	0·1	539·6	1·30
1960-61 (Estimated)	570·0	8·3	30·0	0·3	548·0	1·30

*Figures from 1957-58 onwards are in calendar years.

It will be seen that the actual increase in the *per capita* consumption was less than 3% per annum during the Second Plan Period. While the consumption might have increased at a somewhat more rapid pace if filament and yarn were available in larger quantities, it would seem that the deficiency, if any, in the availability of art silk cloth, was of a marginal character since there has not been any serious complaints about shortage of art silk fabrics.

The likely increase in the *per capita* consumption of art silk fabrics in the period of the Third Five Year Plan cannot be forecast with any great degree of accuracy. However, it seems likely that if supplies were available the *per capita* consumption would increase at the rate of about 8% per annum

during the Third Plan period. On this assumption the *per capita* consumption could be reckoned at about 1·8 yards in 1965-66. The requirements of art silk fabrics by 1965-66 can thus be placed at about 864 million yds.

While estimating the overall requirements of art silk cloth, account has to be taken of exports. Export of art silk fabrics is, at present estimated to be, of the order of 25-30 million yards. But with continuing efforts it might be possible to export about 50 million yards by 1965-66.

On the above basis, the total requirements of art silk fabric by 1965-66 may be reckoned at about 915 million yards. On the assumption that (1) consumption of rayon filament and staple fibre will be in the ratio of 60:40 and (2) that one lb. of yarn will produce 5 yards of cloth, the total requirements of weaving industry for filament yarn and staple fibre by 1965-66 would be of the order of 110 million lbs. and 75 million lbs. respectively.

(ii) *Miscellaneous uses.*—Apart from the weaving industry, rayon filament is required for tyre cord and for other miscellaneous industries and purposes such as knitting and hosiery industries, gas mantles, fishing nets, etc.

The demand for rayon tyre cord from the automobile industry is provisionally estimated at 20 million lbs. by the end of the Third Plan period. However, the norms of consumption of rayon tyre cord and substitutes therefor for automobile tyres are under detailed study and the target for rayon tyre cord may have to be reviewed, if these studies indicate that the requirements would be higher than envisaged.

In addition it is estimated that the demand for rayon filament for miscellaneous industries will increase from the present level of 5 million lbs. to 10 million lbs. by 1965-66.

Thus it is estimated that the total demand for filament would be of the order of 140 million lbs. and that for staple fibre about 75 million lbs. by the end of the Third Plan period.

Pattern of consumption.—In terms of different types of filament and staple fibre the requirements by 1965-66, based on the above target are estimated as follows:

Nature of Fibre	(million lbs.) Filament yarn	Staple fibre
Viscose	*96·0	64·0
Acetate	24·0	8·0
Cuprammonium	10·0	..
Synthetics	10·0	3·0
TOTAL	140·0	75·0

*Includes 20 million lbs. of tyre cord.

The above estimates are broadly in conformity with the first assessment of demand made by the Development Council for the Art Silk Industry. The Development Council, however, subsequently revised its estimates. According to the revised estimates, the requirements of filament and staple

fibre in 1965-66 are placed at 204 million lbs. (including 20 million lbs. for tyre cord) and 141 million lbs. respectively. These figures have been worked out by the Development Council on the assumption that at the rate of 4 yards of cloth per lb. of yarn, the weaving industry will consume 255 million lbs. of filament and staple fibre in 1965-66 to produce 1,020 million yards of cloth of which 60 million yards would be exported. It is further assumed that yarn to the extent of 15 million lbs. would be exported, 25 million lbs. used in admixture with cotton textiles, 20 million lbs. for tyre cord and 30 million lbs. for other ancillary industries. Thus in all 345 million lbs. of filament and staple fibre are estimated to be required by 1965-66.

In considering the expansion of this industry during the Third Plan period due regard will have to be given to the large requirements of foreign exchange for the import of capital equipment and raw materials. In view of the foreign exchange difficulty and the need to provide for the requirements of other higher priority projects, it is considered that an expansion of the order visualised more recently by the Development Council cannot be contemplated during the Third Plan period even if the demand forecasts are fully substantiated making due allowance for factors like additional fiscal levies. The further expansion of the industry would depend on the extent that the programmes for the manufacture of rayon grade pulp, caustic soda and other raw materials make progress and the industry is able to obtain a substantial part of the capital equipment from within the country, thereby reducing the draw on foreign exchange. Till such a favourable situation develops, the development programme for this industry will have to be based on achieving a capacity target of 215 million lbs. by 1965-66.

Against the targets mentioned above, the present position in regard to the licensing of additional capacity is indicated below:

Schemes licensed and under implementation:

(i) *Rayon filament.*—Details of schemes for the manufacture of rayon filament licensed or recommended for licence under the Industries (D&R) Act are given below :

(a) *Viscose filament:*

Name of the unit	Location	Nature of scheme	Existing capacity (million lbs.)	Capacity after scheme has been completed (million lbs.)
M/s. Indian Rayons Corporation	Veraval (Gujarat)	New Unit	..	8·0
M/s. South India Viscose Ltd.	Metupalayam (Madras).	do.	..	8·0
M/s. National Rayons Corporation	Bombay.	do.	..	4·0*
M/s. Baroda Rayons	Baroda (Gujarat)	do.	..	6·0
M/s. Century Rayons	Bombay	do.	..	5·0*
M/s. Century Rayons	Bombay	Expansion	9·6	14·9
M/s. J. K. Rayons Corporation	Kanpur (UP)	do.	4·0	8·0
M/s. Travancore Rayons	Rayonpuram(Kerala)	do.	7·2	11·2
M/s. Delhi Cloth Mills	Delhi	New Unit	..	8·0*

*For tyre cord.

If all the above schemes are implemented, the capacity for viscose filament will increase to about 100·6 million lbs. out of which capacity for the manufacture of tyre cord would be 17 million lbs. The Capital Goods Committee has so far given clearance to import of plant & equipment for the first six schemes.

(b) *Acetate filament.*—Three schemes with a total capacity of 15 million lbs.-per annum have so far been licensed under the Industries Act for the manufacture of acetate filament. These are:

M/s. Sirsilk Ltd. have been given a licence to expand their existing capacity from 4 million lbs. to 8 million lbs. per annum.

M/s. Modi Spg. & Wvg. Mills have been given a licence to set up an acetate rayon plant at Modinagar in U.P. The capacity of the plant is expected to be 8 million lbs. per annum.

M/s. Modern Mills have been recommended for a licence to spin 3 million lbs. of acetate yarn from indigenous cellulose acetate flakes proposed to be manufactured by a sister concern of this company. The plant is proposed to be located at Harihar in Mysore.

All these schemes are however yet to be cleared by the Capital Goods Committee for import of plant and equipment. On the implementation of these schemes the capacity for the manufacture of acetate filament will increase to 19 million lbs.

(c) *Cuprammonium.*—Licences under the Industries Act have been given for the manufacture of cuprammonium for the first time in the country (i) to M/s. Modern Mills Ltd. for setting up a new unit at Harihar in Mysore with an annual capacity of 5 million lbs. and (ii) to M/s. Swadeshi Cotton Mills for putting up a plant at Bangalore with a capacity of 8 million lbs. per annum. Out of these, the Capital Goods Committee has so far agreed to the release of foreign exchange for the scheme of M/s. Modern Mills Ltd.

On the implementation of these schemes, the capacity for the manufacture of cuprammonium will be 13 million lbs.

(d) *Synthetics.*—With a view to manufacturing synthetics for the first time in the country, a number of schemes have been licensed or recommended for licence under the Industries Act. These are given below:

Name of the Unit	Location	Annual capacity (million lbs.)
M/s. J. K. Investment Trust Ltd.	Kotah (Rajasthan)	0·48
M/s. Nanubhai Industries Ltd.	Goregaon,(Bombay)	5·00*
M/s. Century Rayons Co. Ltd.	Bombay	1·60
M/s. Prabhulal Bhikhabhai & Co.	Bulsar (Gujarat)	4·00
M/s. Arthur Import & Export Co.	Bombay	2·35

* Includes 2 million lbs. of nylon tyre cord.

Of these the scheme of M/s. J. K. Investment, M/s. Century Rayons and M/s. Arthur Import Export will be based on imported nylon salts, while those of M/s. Nanubhai Industries and M/s. Prabhulal Bhikhabhai envisaged also the production of nylon salt *e.g.* caprolactum from indigenous raw materials.

With the implementation of the above schemes, the capacity for synthetics will be about 13·4* million lbs. The Capital Goods Committee has, however, so far given clearance to import of plant and equipment for only the first three schemes. According to the present policy, licensing of nylon units is subject to the condition that no foreign exchange will be provided either for the import of capital goods or for the import of raw materials and that the entrepreneurs will make arrangements for the import of capital equipment and raw materials through inflow of foreign capital and by export of finished products.

(ii) *Staple fibre.*—Two new units with a total annual capacity of 9 million lbs. have been given licences under the Industries Act for the manufacture of staple fibre. Details of these are given below:

M/s. South India Viscose Ltd. have been given a licence to manufacture 8 million lbs. of viscose staple fibre at Mettupalayam in Madras. This scheme is under implementation and is expected to be completed by 1961-62.

M/s. Modern Mills have been recommended for licence for the manufacture of one million lbs. of acetate staple fibre from cellulose acetate flakes at Harihar, Mysore. The scheme is, however, yet to be cleared by the Capital Goods Committee for import plant and equipment.

On the implementation of these schemes the total capacity for the manufacture of staple fibre will increase from 48 million lbs. to 57 million lbs.

To sum up the overall position regarding licensing of additional capacity in relation to anticipated requirements is indicated in the following statement:

(million lbs.)

Name of the fibre	Estimated requirements by 1965-66	Total capacity expected on the basis of licences issued under the Industries Act	Total capacity expected on the basis of C. G. clearance
1. Rayon filament—			
Viscose	96·0	100·6	84·6
Acetate	24·0	19·0	4·0
Cuprammonium . . .	10·0	13·0	5·0
Synthetics	10·0	13·4	7·1
TOTAL	140·0	146·0	100·7

*Includes 2 million lbs. of nylon tyre cord.

Name of the fibre	Estimated requirements by 1965-66	Total capacity expected on the basis of licences issued under the Industries Act	Total capacity expected on the basis of C. G. clearance
II. Staple fibre —			
Viscose	64·0	56·0	56·0
Acetate	8·0	1·0	..
Synthetics	3·0	..	..
TOTAL	75·0	57·0	56·0
TOTAL OF I AND II	215·0	203·0	156·7

Thus, the schemes so far licensed or recommended for licence under the Industries Act will increase the overall capacity for rayon filament, staple fibre and synthetics to about 203 million lbs. as against the target of 215 million lbs. envisaged for the Third Plan. In terms of the foreign exchange releases so far agreed to, the capacity is lower, *viz.*, of the order of 157 million lbs.

As this industry makes a substantial draw on foreign exchange, further licensing of capacity and releases of foreign exchange will have to be closely co-ordinated with the progress in the indigenous supply of raw materials and the overall foreign exchange position on the one hand and with the actual progress made on schemes already licensed on the other.

Investment and employment.—It is estimated that a sum of Rs. 75 crores would have to be invested in the rayon and synthetic fibres industry during the Third Plan period to achieve the targets indicated. In estimating this investment, it has been assumed that half of the expenditure on schemes under implementation at the end of the Second Plan would spill over into the Third Plan.

The foreign exchange component of this investment is placed at about Rs. 45 crores.

The expansion of the industry is estimated to provide employment to about 8,000 additional persons.

Requirements of raw materials.—The major raw materials for the viscose process of filament and staple fibre, are rayon grade pulp, caustic soda and sulphur. In the acetate process cotton linters*, alcohol and caustic soda are used. The requirements of these raw materials for the production of

*Cotton linters are also used for producing rayon grade pulp.

96 million lbs. of viscose filament, 64 million lbs. of staple fibre and 32 million lbs. of acetate filament and acetate staple fibre are estimated as follows:

Rayon grade pulp	82,000 tons
Caustic soda	80,000 tons
Sulphur (including carbon disulphide)	60,000 tons
Alcohol	6.4 million gallons
Cotton linters (for acetate process only)	13,000 tons

In addition small quantities of copper sulphate, ammonia, sodium hydroxide, cotton linters and sulphuric acid will be required for the manufacture of cuprommonium and phenol and ammonia for the manufacture of caprolactum.

Of the above raw materials the entire requirements of copper sulphate and part of the requirements of sulphur will be met by imports. Caustic soda, alcohol, cotton linters and other chemicals are expected to be available indigenously.

The entire requirements of rayon grade pulp are at present met by imports. A number of schemes for the manufacture of rayon grade pulp with a total annual capacity of about 270,000 tons have, however, been licensed or recommended for licence under the Industries Act. Details of these are given in Annexure I. Most of these schemes are still in the preliminary stages. Only two *viz.*, Nos. 1 & 6 in the annexure have been cleared by the Capital Goods Commmittee for import of plant and equipment. Since requirements, including the requirements for cellulose film are estimated to be of the order of only 90,000 tons, it will be neither necessary nor possible to provide foreign exchange for all the schemes that have been licensed. Nevertheless, high priority is attached to building up capacity within the country sufficient to meet requirements and therefore, every effort will have to be made to release foreign exchange at an early date so as to meet all requirements by the end of the Third Plan period.

B. Cellulose Film

The raw materials employed in the manufacture of cellulose film are similar to those employed in the production of viscose filament. To complete the picture, therefore, the programme for the cellulose film industry is also discussed in this chapter.

Capacity, production & consumption.—The first unit for the production of cellulose film was set up by M/s. Travancore Rayon Ltd. with an annual capacity of 400 tons in 1960. During the Second Plan period the capacity of the unit was increased to 3,600 tons per annum. This is at present the only unit in actual production. In addition licences have been granted to two more units, details of which are given below:

(a) M/s. Kesoram Cotton Mills have been licensed to set up a cellulose film unit at Hooghly with a capacity of 1,800 tons per annum. The foreign exchange for the import of plant & equipment for this project has been cleared by the Capital Goods Committee.

(b) M/s. National Rayons have been licensed for a capacity of 1,800 tons per annum. This unit will be set up in Maharashtra. The scheme is however, yet to be cleared by the Capital Goods Committee for import of plant and equipment.

On the basis of schemes so far licensed under the Industries Act, the total capacity for cellulose film is expected to increase from 3,600 tons to 7,200 tons per annum. Of this, the total capacity expected to materialise on the basis of capital goods clearance is 5,400 tons.

The consumption of cellulose film on the basis of production plus imports during the last few years is estimated to be as under:

(tons)

	Production	Imports	Consumption
1958	1,622	166	1,788
1959	1,604	250	1,854
1960	2,084 (estimated)	670	2,754

During this period there was an acute scarcity of cellulose film due to restrictions imposed on the import of cellulose film from 1957 onwards. Although the position has somewhat eased in 1960 with an increase in indigenous production coupled with higher imports, there is still some shortage of cellulose film on account of import restrictions. If cellulose film had been available more freely, it is estimated that the consumption would have been much higher. According to the Ministry of Commerce & Industry the effective demand for cellulose film is at present about 5,000 tons

Estimated requirements, capacity and production by 1965-66.—With the increase in popularity of superior packing materials, the demand for cellulose film is expected to grow steadily during the Third Plan period. The demand for cellulose film is also on the increase on account of its usefulness as an attractive and improved medium for packing export articles. Current projections are that by 1965-66 the total demand will go up to about 10,000 tons per annum. It is necessary that the demand for export purposes should be met from whatever production is achieved in the different years of the Third Plan.

As already mentioned a capacity of 7,200 tons will be achieved on the basis of schemes so far licensed and 5,400 tons on the basis of capital goods clearance given so far. As in the case of viscose filament industry, further expansion of capacity for cellulose film will have to be closely integrated with proposals for the manufacture of the raw materials in the country. It is considered that the immediate requirements for cellulose film can be reasonably met with the completion of schemes for which foreign exchange has already been given. The further expansion of this industry will have to be reviewed by about the middle of the Third Plan period in the light of the position then existing in regard to the supply of raw materials and other relevant factors.

Requirements of raw materials.—The requirements of raw materials for a production target of 5,400 tons of cellulose film are estimated to be as follow :

	(tons)
Rayon grade pulp	6,200
Caustic soda	5,400
Sulphur	4,500

The following table summarises the development of rayon, staple fibre and cellulose film industry envisaged during the period of the Third Plan :

	1960-61	1965-66
Annual capacity :		
(1) Rayon filament (million lbs.)	52·3	140·0
(2) Staple fibre (million lbs.)	48·0	75·0
(3) Cellulose film (tons)	3,600	5,400
(4) Rayon grade pulp (tons)	..	100,000
Production :		
(1) Rayon filament (million lbs.)	47·0 (Estimated)	140·0
(2) Staple fibre (million lbs.)	48·0 (Estimated)	75·0
(3) Cellulose film (tons)	2,084 (Estimated)	5,400
(4) Rayon grade pulp (tons)	..	90,000
Exports :		
(1) Art Silk Cloth (million yds.)	30·0 (Estimated)	50·0

ANNEXURE I

Rayon Grade Pulp Schemes

Sl. No.	Name of schemes licensed	Location	Capac ty licensed tons/year
(A) *Schemes Licensed—*			
	M/s. Gwalior Rayons	Mavoor (Kerala) .	45,000
	M/s. Greater Mysore Rayons Grade Pulp & Paper Mills, Bangalore.	Siddalgundi (Mysore)	30,000
	M/s. West Coast Paper Mills Ltd., Bombay . .	Dandeli (Mysore)	27,000
	M/s. Sundatta Foods & Fibres, Bombay . . .	Harihar (Mysore)	3,000
	M/s. Rohtas Industries Ltd., Dalmianagar . .	Badarpur (Assam)	60,000
	M/s. Travancore Rayons Ltd.	Rayonpuram (Kerala)	3,600
	M/s. Cellulose Products of India, Ahmedabad . .	Kathwada (Gujarat)	7,200
	M/s. Orient Trading Co., Ahmedabad . . .	Broach (Gujarat) .	3,600
	M/s. J. K. Cotton Spg. & Wvg. Mills, Co. Ltd., Kanpur.	Kanpur (U.P.) .	3,000
	M/s. Purshotam Lal Jhunjhunwala, Bombay (M/s. Hindustan Rayon Pulp Ltd.)	Kalyan (Maharashtra)	3,600
(B) *Schemes approved—*			
	M/s. National Rayons, Bombay	Nanjangud (Mysore)	30,000
	M/s. Manju Shree Industries Ltd.	Cachar (Assam) .	54,000

66. WOOLLEN TEXTILES

The woollen textile industry consists of the organised mill sector, the cottage sector, the hosiery units and carpet weaving units (mostly cottage units). This note deals chiefly with the mill sector but at the same time covers indirectly the cottage and hosiery sectors, while taking a view on the yarn requirements for the production levels envisaged under them. The major problem facing the woollen industry relates to the supply of raw wool and wool tops. Programmes for improvements, quality-wise and quantity-wise in respect of indigenous sheep farming and wool production, have been included under Agriculture and Allied Activities within the Third Plan as described latter on in the section under "Raw wool".

The principal processes of the woollen textile industry are sorting, carding and combing of raw wool, and spinning and weaving. Combing is required for producing wool tops to be used by the worsted spinning section of the Industry. There are two other systems of spinning, namely woollen spinning and shoddy spinning. The utilisation of yarn produced by these three systems of spinning differs as outlined below:

Worsted Yarn.—Used as superior weaving yarn for fabrics, hosiery yarn for knitting into under and outer wear and shawls.

Woollen Yarn.—Used as carpet making material and for producing medium quality goods such as blankets, tweeds and suitings.

Shoddy Yarn.—Used mainly for blankets.

1. Review of Progress under the Second Five Year Plan:

Targets.—It was envisaged that indigenous production of woollen fabrics would be increased to 20 million yards by the end of the Second Plan (corresponding to 17·5 million lbs. of yarn) from the level of 15 million yds. in 1955-56. The demand for hosiery yarn was expected to increase from 4 million lbs. to 5 million lbs. during the same period. The requirements of mill spun yarn at the end of the Second Plan for carpets and for other products of the cottage sector were estimated at 2·5 million lbs. and 2 million lbs. respectively. Thus the total requirements and the production targets of mill spun yarn in the last year of the Second Plan were placed at 27 million lbs.

The spinning capacity of the industry at the end of the First Plan consisted of 61,032 woollen spindles and 96,416 worsted spindles. On the basis of the additional spindleage that had already been licensed during the First Plan period, this capacity was expected to increase to 62,768 woollen spindles and 123,416 worsted spindles. The production capacity of this spindleage on double shift was assessed at 45.5 million lbs. of yarn. The weaving capacity, taking into account the unregistered as well as registered units, was assessed at 48 million yards of cloth as against the production target of 20 million yards. In view of this position, it was visualised that licensing of additional spindles or looms would not be necessary in the

Second Plan, barring a certain amount of additional capacity which might be required in view of special factors, such as balancing of uneconomic units.

The spindleage figures referred to above did not take account of the requirements for shoddy yarn, the demand for which was expected to increase in view of its relative cheapness. The matter was left for further examination with a view to fixing a separate target.

Capacity.—The increase in capacity during the Second Plan period, and the position which would be obtaining on the implemetation of all schemes licensed are shown below:

	Unit	Installed capacity on 31st March, 56	Installed capacity on 31st March, 61	Installed capacity when all licensed schemes are implemented
Woollen spindles	Nos.	61,032	53,554	53,554
Worsted spindles	Nos.	96,416	124,664	129,364
Shoddy spindles	Nos.	..	11,419	19,087
TOTAL SPINDLES		157,448	189,637	202,005
Power looms				
Registered	Nos.	4,051	2,000	2,000
Unregistred	Nos.		2,000	2,000
Wool combing	million lbs.	..	10	16

Details of the schemes under implementation for installation of additional spindleage and of combing capacity are shown in Annexures I & II respectively.

The investment for installing about 30,000 additional spindles (net of spindleage converted from woollen to shoddy spinning) during the Second Plan is estimated at about Rs. 2 crores. The imports of woollen textile machinery (including that used for replacement) during the first four years of the Second Plan works out to an average of about Rs. 40 lakhs per annum.

Combing plants.—As stated previously, the worsted spinning section of the industry requires wool tops which are produced from raw wool by the process of combing. In the development programme of the industry under the Second Plan considerable emphasis was placed on the creation of indigenous combing capacity, and a target of 9·0 million lbs. of wool tops was proposed. In 1959 a Sub-Committee of the Licensing Committee went into the question of what should be the pattern for licensing of combing

capacity. The Sub-Committee expressed the view that independent combing plants should have a capacity of not less than 5 million lbs. per annum to ensure economic production. It also expressed the view that in the case of combing units attached to spinning mills, *i.e.* captive combing plants, a unit of only 1 to 1·2 million pounds capacity per annum could be economic; and it further felt that there would be some advantage in allowing establisment of such captive combing plants. Following consideration of the report, combing capacity to the extent of 16 million pounds per annum has been licensed by the Government. Out of this, the installation of a unit of 10 million pounds combing capacity by M/s. Issac Holdens (India) in collaboration with M/s. Duncan Brothers was completed towards the end of the Second Plan period. In addition there are 4 schemes in the initial stage of implementation, each with a licensed capacity of 1·5 million lbs. to be located in the Punjab, Rajasthan, U.P. (Dehra Dun) and Bombay City respectively. The pattern of location that has emerged has taken into account the desirability of promoting development in backward areas as well as the need to supply economically the requirements of the existing worsted spinning units which are located mostly at Bombay City and in the Punjab. Approval has also been given to establishment of a combing unit of 5 million lbs. capacity to be set up as a co-operative venture by the spinning mills in the Ludhiana area to meet their own requirements. The actual import of wool tops in 1960 was 14·0 million lbs. This figure is somewhat below the peak level of import of wool tops during the Second Plan period, namely about 16 million lbs. in 1957 and 1958; and the decline has been due to the country's foreign exchange difficulties. The potential demand for wool tops at the end of the Second Plan, had there been no import restrictions, is estimated as of the order of 20 million pounds.

In addition to the schemes for manufacture of wool tops, there are three schemes under implementation for manufacture of synthetic fibre tops, with an aggregate licensed capacity of 3·36 million lbs. per annum. Details of these schemes are shown in Annexure III. Synthetic fibre tops may serve as partial substitutes for wool tops when blended with the latter to produce mixed fabrics.

Production of cloth and yarn.—The production trends of woollen and worsted fabrics and yarn by the organised woollen mills during the Second Plan were as follows:

(million yards)

	1955	1956	1957	1958	1959	1960
1	2	3	4	5	6	7
Fabrics—						
Suitings	4·55	5·42	6·30	7·52	6·61	6·13
Blankets & Rugs	3·27	4·19	4·75	3·91	4·29	2·67
Melton & Shoddy	0·54	0·16	0·28	0·48	0·23	0·02
Lohis & Shawls	1·96	1·89	2·10	1·39	1·11	0·89
Uniform cloth	0·86	0·97	1·26	1·79	1·68	1·29
Other sorts	2·78	3·71	3·80	4·00	3·85	4·27
TOTAL	13·96	16·34	18·40	19·09	17·77	15·27

1	2	3	4	5	6	7
Yarn—						
Woollen .	10·28	11·62	13·10	12·97	14·55	15·06
Worsted .	10·41	13·97	14·72	16·13	15·18	12·74
TOTAL .	20·69	25·59	27·82	29·10	29·73	27·80

It will be noted that production on the whole increased at a fairly rapid rate during the early years of the Second Plan, but suffered a setback after 1958; apparently due mainly to shortage of foreign exchange for importing raw wool and wool tops, and to a lesser extent due to a rise in raw wool prices.

Imports.—Imports of woollen yarn and products have been as follows:

(Value in Rs. lakhs)

	1955-56		1956		1957		1958		1959		1960	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Woollen yarn, Quantity in million lbs.	3·9	104	4·3	114	4·6	96	3·0	49	0·6	10	0·2	11
Woollen fabrics, Quantity in million yds.	2·3	132	1·3	90	1·3	131	0·3	30	0·2	23	0·1	13
Blankets, Quantity in million lbs.	1·1	31	1·1	32	0·4	12	—	—	—	—	neg	1

It will be seen that all imports, including, since recently, imports of yarn, have declined sharply, as a result of the foreign exchange difficulties.

Exports.—Exports of woollen products have been as follows:

(Value in Rs. Lakh)

	1955-56		1956		1957		1958		1959		1960	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Fabrics (Quantity in million yds.)	0·01	2	0·04	7	0·07	10	0·36	48	0·64	81	0·25	37
Carpets, Druggets etc.*	9·6	397	9·6	404	2·01	419	1·90	452	2·07	482	1·99	484
Blankets (Quantity in million lbs.)	—	—	—	—	0·3	7	0·2	7	0·3	7	0·2	5

*Quantity for 1955-56 and 1956 in million lbs., for 1957 and subsequent years in million square yards.

The exports of cloth have increased during the Second Plan period, mainly on account of exports to U. S. S. R. In blankets, India now appears as an exporter, though on a small scale. It had hitherto been an importer.

Availability.—Taking into account domestic production, imports and exports, the internal availability of cloth is found to have increased from 16·3 million yards in 1955 to 19·0 million yards in 1958. Thereafter it declined to 15·1 million yards in 1960. As already pointed out, the decline in the latter part of the Second Plan period has been due to the restricted availability of imported raw materials consequent on foreign exchange difficulties, as well as the rise in raw wool prices.

II. Programmes of Development in the Third Plan:

Estimated requirements.—During the first three years of the second Plan, the consumption of woollen cloth as indicated above increased at an average rate of 7% per annum. The decline in consumption during the last two years of the Second Plan was not due to any lack of demand but merely due to shortage of foreign exchange for import of raw materials. Thus the rate of increase in consumption during the first three years of the Second Plan may be taken as the more appropriate basis for projecting the growth of potential demand. On this basis, and taking into account the more rapid rate of increase in national income during the Third Plan, the estimate by the Development Council for the Woollen Industry, that the demand for woollen fabrics is likely to go up by about ten per cent per annum during the Third Plan, is considered acceptable as the basis for planning. Moreover the potential demand for cloth in 1960 is estimated (again on the basis of the consumption trends during the first three years of the Second Plan) at about 22 million yards, considerably higher than the actual availability in that year. Accordingly, assuming an annual increase of 10 per cent over the base level figure of 22 million yards, the demand for woollen cloth in 1965 is estimated at 33 million yards.

The Development Council has estimated that exports may go up to a level of about 2 million yards per annum by the end of the Third Plan. On the basis of present indications, the market for Indian cloth would be mainly in the East European countries. In view of the rupee balances held by these countries, it is reasonable to expect that the relatively modest export target laid down by the Development Council would be attained, if not bettered.

On the basis of these estimates of demand for fabrics, the requirements of weaving yarn have been worked out. The requirements of hosiery and knitting yarn and of yarn for manufacture of blankets and other products of the cottage sector have been extrapolated on the basis of estimates

relating to the current rate of increase. In the case of Carpets, it has been assumed that requirements will be stationary. On the basis of these assumptions the requirements at the end of the Third Plan would be as follows:

	1960	1965
Cloth (million yds.)		
Internal requirements	22*	33
Exports	0·25	2
Total Cloth Requirements	22	35
Yarn (million lbs.)		
Weaving yarn	20*	30
Yarn for blankets, carpets & other cottage products (woollen)	5*	9
Hosiery & knitting yarn (worsted)	9**	13
Total yarn requirements	34	52

*Potential demand.

The break-up of yarn requirements as between woollen, worsted and shoddy would mainly depend on the relative use of these types of yarn in the production of cloth. Tentatively the requirements for weaving yarn may be equally divided between woollen and worsted yarn, which would bring up the total requirements of worsted yarn to 28 million lbs., and of woollen and shoddy yarn to 24 million lbs. at the end of the Third Plan.

Targets of capacity and production:

Spinning capacity.—On the basis of yardsticks suggested for rating the spinning capacity, the single shift production capacity of the present installed spindleage and the ultimate spindleage that would be reached after completion of schemes under implementation may be estimated at about 29 million lbs. and 30 million lbs. respectively. Thus the installed and licensed spindleage, worked on double shift, should be more than adequate to supply all the yarn requirements envisaged at the end of the Third Plan period. It is felt that no additional spindleage is required from an overall point of view. Taking into account any reasonable pattern of distribution of cloth demand as between woollen and worsted cloth, it appears unlikely that the present installed-*cum*-licensed woollen spindleage would be inadequate to meet the respective requirements at the end of the Third Plan. As regards shoddy spindleage, the schemes already licenced, if fully implemented, should also suffice to meet in full the requirements at the end of the Third Plan. Moreover, surplus woollen spindleage could be converted to produce shoddy yarn to the extent necessary.

Weaving capacity.—The production capacity on single shift of the existing 2,000 registered looms is estimated at about 12 million yards per annum. Thus the registered loomage, if worked on three shift basis, would suffice to produce the expected requirements of 35 million yards of cloth. Moreover, taking into account the existince of an additional 2,000 unregistered

looms, it is felt that the existing loomage, even if the average rate of working were to be much less than three shifts per day, would be adequate to meet the demand.

It follows from the above assessment that no additional spinning or weaving capacity will be required from the angle of meeting the demand envisaged for 1965-66. However, some additional capacity may have to be licensed to small units to bring them up to an economic size. It is considered that in the existing conditions the minimum economic size is about 1,200 spindles in the case of spinning units and about 50 looms in the case of weaving units.

Combing capacity.—On the basis of the estimates of worsted yarn requirements as previously indicated it is expected that the demand for wool and synthetic fibre tops may increase to about 31·5 million lbs. by the end of the Third Plan. It is envisaged that additional combing capacity will be installed to the extent required to meet in full the requirements of wool tops from indigenous production. As previously suggested, the additional combing capacity may be allocated between relatively small combing units (of the order of 1·5 million lbs. annual capacity) attached to worsted spinning mills and independent combing units of at least 5 million lbs. annual capacity. In deciding the location of the latter type of combing units the factors to be kept in mind are the desirability of promoting the development of backward areas (in Rajasthan, Jammu and Kashmir, Himachal Pradesh and the hill districts of U. P.) provided these areas are likely to produce wools suitable for combing; and the desirability of locating combing units near worsted spinning mills (located mostly at Bombay City and in the Punjab).

Rehabilitation and modernisation.—As indicated above, no investment would be required for establishing additional spinning and weaving capacity. However, the report of the Working Group for the Rehabilitation and Modernisation of the Woollen Industry, 1960, (appointed by the National Industrial Development Corporation) has indicated that the industry would require a substantial amount of rehabilitation and modernisation during the Third Plan, costing about Rs. 11·25 crores, of which the foreign exchange element would be about Rs. 9·25 crores. The report of the Working Group has also indicated that the industry would be able to finance from its own resources 75% of this investment, while the Government supported financial institutions would have to supply the remaining 25% of the capital required. Government have indicated that it would not be possible for N. I. D. C. to supply any finance for rehabilitation and modernisation of the woollen textile industry, in view of the heavy obligations already assumed by this institution to finance the programmes of the cotton and jute textile industries. In any case the real bottleneck in the programme of rehabilitation and modernisation is likely to be not finance but foreign exchange.

Powerloom carpets.—As carpets woven on powerlooms in other countries have captured a large and growing share of the world market because of their relative cheapness, a suggestion was made that an indigenous powerloom carpet industry should be set up to cater mainly for export markets.

On the other hand, it was felt that if such an industry were set up it would have to be allowed to sell a portion of its output in the internal market, thereby competing with handloom carpets. On balance of all considerations the introduction of powerlooms in this sector is not considered desirable.

Raw wool.—On the basis of the production planning outlined above, the requirements of raw wool for the mill sector, after allowing for an estimated 20% loss in combing and spinning of worsted yarn and an estimated 12% loss in spinning of woollen yarn, have been worked out as indicated in the table below. The break-up of raw material requirements as between worsted spinning on the one hand and woollen and shoddy spinning on the other, has been based on the tentative pattern indicated in page 625. In regard to the requirements of raw material for worsted spinning at the end of the Third Plan, credit has been taken in full for production of 4·5 million lbs. of terylene staple fibre recently licensed to M/s. Imperial Chemical Industries (India) Ltd. While it is possible that part of this output may be consumed by cotton mills, it is assumed here that the entire production will be used for manufacture of staple fibre tops to serve as a substitute for wool tops in worsted spinning. It is further assumed that a corresponding capacity for manufacture of stable fibre tops will come into existence during the Third Plan period (the capacity already licensed is 3·36 million pounds per annum—See Annexure III).

Estimated requirements of raw wool and staple fibre for mill-spun yarn on clean basis

	1960 (estimated consumption)		1965 (estimated requirements)	
	Quantity (million lbs.)	Value (Rs. crores)	Quantity (million lbs.)	Value (Rs. crores)
For worsted spinning				
Raw wool, imported	16·5†	8·6	30·5	13·7*
Synthetic fibre, indigenous	..	..	4·5	..
For wool and shoddy spinning	17·2	..	27·5	..
TOTAL	33·7	..	62·5	..

†Estimated raw wool equivalent of imported wool tops.

*Valued at Rs. 4·50 per lb. of imported wool of combing types

The requirements of wool for cottage spinning which are not included in the above table are currently estimated at about 10 million lbs. per annum (on clean basis).

At present a considerable portion of the wool consumed is being imported. The entire requirements of raw wool for worsted spinning are being imported (currently in the form of wool tops) at an annual rate of 15 to 16 million lbs. (in terms of raw wool equivalent of imported wool tops). The types of wool currently produced in the country are not suitable for

combing. Raw wool, wool waste and wool shoddy for use by the woollen spinning sector are also being currently imported to the tune of 6 to 10 million lbs. per annum. If the requirements of imported wool were to increase in step with the expansion of output of woollen textiles as envisaged above, a heavy increase in foreign exchange expenditure would be entailed. In order to avoid this contingency, it would be desirable to make a serious effort to step up the production of indigenous wool of quality suitable for mill use, particularly for finer products. Under the Third Plan programmes for the development of live-stock products, it is envisaged that the indigenous production of wool will be stepped up from 72 to 90 million lbs. It is also envisaged that an effort will be made to improve the quality of indigenous wool. These objectives are proposed to be achieved by setting up or expanding sheep-breeding farms to improve the breeds of sheep (which would imply an increase in output per animal as well as improvement in quality) and also by increasing the size of flocks.

It does not however appear realistic to expect that during the period of the Third Plan it will be possible to upgrade the quality of indigenous wool to a level suitable for combing purposes to any significant extent. Therefore it is to be expected that the entire requirements of wool for manufacture of wool tops (which in turn is the raw material for worsted spinning) will as at present be entirely met from imports. On this basis, the annual requirement of foreign exchange for import of combing wool/ wool tops is expected to increase by about Rs. 5 to 6 crores over the Third Plan. In order to minimise such imports there is a need to investigate the potentialities of the semi-worsted spinning system, which is able to produce fine yarn from wools unsuitable for combing. One semi-worsted spinning unit has been licensed during the Second Plan (*vide* Annexure I).

The development of indigenous wool production may, on a realistic basis, at best be expected to improve the supply of raw wool for the woollen spinning sector in terms of quantity and quality. In view of the targets set for raw wool production as indicated above, it should be possible to supply all the additional requirements of raw wool for the woollen spinning sector from indigenous sources, provided the quality is satisfactory. On the other hand, it would appear both necessary and desirable to provide for additional imports of shoddy as this is a relatively low cost material. It should be possible to eliminate imports of wool wastes in view of the expected increase in indigenous supply of waste as a by-product of the increase in combing and spinning activity. It is, therefore, expected that the combined value of imports of wool wastes and shoddy would have to be maintained at least at the existing level.

On the basis of the considerations outlined in the preceding paragraphs, the foreign exchange requirements for import of raw wool, waste and shoddy in 1965 are estimated at about Rs. 14·5 crores (of which about Rs. 13·7 crores would be for wool of combing types) as against actual imports valued at Rs. 10·7 crores in 1960.

The following table summarises the development of woollen textile industry during the period of the Third Plan:

	1965-66 spindles or looms '000 Nos.	1965-66 Annual capacity on double shift
Capacity—		
Combing	..	31·5 million lbs.
Woollen and shoddy spindles, ...	72·6	35 million lbs.
Worsted spindles, ...	129·4	26 million lbs.
Looms		
Registered looms	2	24 million yards
Unregistered looms	2	24 million yards

	1960 actuals	1965 targets
Production—		
Wool tops (million lbs.)	..	27·5
Synthetic fibre tops (million lbs.)	..	4
Woollen and shoddy yarn (million lbs.)	15·1	24
Worsted yarn (million lbs.)	12·7	28
TOTAL YARN .	27·8	52
Cloth (million yards)	15·3	35

ANNEXURE I

Schemes licensed and under implementation—Spinning capacity

Name of the firm	Location	Worsted spindles (number)	Shoddy spindles (number)
Jammu & Kashmir—			
Govt. woollen Mills	Srinagar	1,200	..
Maharashtra—			
M/s. Arthur Import & Export Co.	Bombay	..	800
M/s. Himatlal J. Dani	Bombay	..	800
M/s. Wool & Textile Waste Bombay Co.	Bombay	..	168
Punjab—			
M/s. Model Woollen & Silk Mills	Amritsar	..	2,000
M/s. Saligram Prannath	Ludhiana	100	..
M/s. Oswal Woollen Mills	Ludhiana	800	..
M/s. Oswal Cotton Spinning and Weaving	Ludhiana	1,600	..
M/s. Central Cotton Co.	Ludhiana	..	800
Rajasthan—			
M/s. Rajasthan Semi-worsted spinning Mills	Jaipur	1,000 (Semi-worsted)	..
W Bengal—			
M/s. Kusum Hosiery Mills	Calcutta	..	240
M/s. New Era Hindustan Woollen Mills	Calcutta	..	1,600
M/s. Bharat Woollen Mills	Calcutta	..	1,280
TOTAL		4,700	7,688

ANNEXURE II

Schemes under implementation—Wool tops

Name of the firm	Location	Capacity licensed in million lbs. per annum
Maharashtra—		
M/s. Dhruva Woollen Mills	Thana	1·5
Punjab—		
M/s. Kanshiram Kidarnath	Chandigarh	1·5
Rajasthan—		
M/s. Foreign Import and Export Association	Kotah	1·5
U.P.—		
M/s. Bombay Fine Worsted	Dehra Dun	1·5
TOTAL		6·0

ANNEXURE III

Schemes under implementation—Synthetic Fibre Tops

Name of the firm	Location	Capicaty licensed in million lbs. per annum
Maharashtra		
M/s. Hiralal Baldevkishen	Thana	1·36
Punjab		
M/s. Commonwealth Spinning and Knitting Mills Ltd.	Ludhiana	1·0
M/s. Arthur Import and Export Co. Bombay	--	1·0
TOTAL		3·36

TIMBER INDUSTRIES

67. MATCHES

1. Review of Progress in the Second Plan:

Targets.—The Planning Commission estimated that the demand for matches would be 35 million gross boxes by 1960-61. Though the capacity of 35·3 million gross boxes existing at the commencement of the Plan was considered sufficient to meet this demand, it was considered that a moderate increase in capacity in the cottage sector should be allowed in view of its considerable potentialities for providing employment. It was therefore recommended that no increase in capacity in the large-scale sector should be permitted during the Second Plan Period and the additional demand arising in this period should be entirely reserved for the cottage sector which should be assisted to improve its output and quality.

Capacity and production.—At the beginning of the Second Plan period, the annual rated capacity of the match industry was estimated at 35·3 million gross boxes (706,000 cases each of 50 gross boxes of 60 sticks). Since then the capacity of the industry is estimated to have increased to about 45·3 million gross boxes (905,796 cases each of 50 gross boxes of 60 sticks). The increase in capacity has been mainly on account of expansion in the cottage sector. The number of factories in production increased from 234 in 1955-56 to 439 in 1960-61 as indicated below:

	Number of Match Factories	
	1955-56	1960-61 (on 30-11-60)
'A' class factories	8	6
'B' class factories	103	85
'C' class factories	81	348
'D' class factories	42	
TOTAL	234	439

The production of matches in the year 1955-56 and during the period of the Second Plan has been as given in the table below :

('000 gross boxes)

	60's	50's	40's	30's	Total	Others including Bengal Lights	Total of all varieties
1955-56	20,237	..	20,796	..	41,033	615	41,648
1956-57	21,691	..	21,380	..	43,071	587	43,650
1957-58	23,222	36	13,312	159	36,729	452	37,181
1958-59	23,457	5,535	6,089	5,562	40,643	586	41,229
1959-60	25,008	6,312	6,998	4,742	43,060	549	43,609
1960-61	28,523	3	13,562	..	42,128	562	42,690

The above production figures show an erratic trend during the Second Plan period. The production of matches appears to have declined in 1957-58 and thereafter showed a gradual increase.

The following table which indicates the production of matches expressed in terms of gross boxes of sixty sticks will enable the production figures to be compared on a more uniform basis:

	Production of matches (excluding Bengal lights and others) million gross boxes of sixty sticks each
1955-56	34·1
1956-57	35·9
1957-58	32·2
1958-59	34·9
1959-60	37·3
1960-61	37·5

The production target envisaged for 1960-61 was 35 million gross boxes. This was exceeded by a considerable margin in 1959 and 1960.

In order to indicate the trend of production among the large and small units, the figures of production of matches by factories of different classes during the last few years are given below:

(in million gross boxes of 60 sticks each)

	1955-56	1956-57	1957-58	1958-59	1959-60	1960-61
'A' class	18·57	19·78	20·18	22·68	24·55	23·83
'B' class	14·87	15·37	11·33	11·26	11·34	11·20
'C' class	0·61	0·68	0·56	0·76	1·11	2·31
'D' class	0·03	0·11	0·14	0·20	0·31	0·23
TOTAL	34·08	35·94	32·21	34·90	37·31	37·57

The total volume of production in 'B', 'C' and 'D' class factories has fallen from 15·51 million gross boxes in 1955-56 to 13·74 million gross boxes in 1960-61 (*i.e.*, a net fall of 1·77 million gross boxes) although the total production of matches (including production by 'A' class factories) has increased during the same period by about 3·49 million gross boxes. It is therefore, clear that the increase in the production of 'A' class factories partly covers the fall in the production of 'B', 'C' and 'D' class factories.

Imports and exports.—Imports of matches have been negligible confined to special varieties. Exports showed a significant rise in 1959 but declined in 1960. Statistics of imports and exports for the last five years are as under:

(gross boxes)

	Imports*	exports*
1956-57	475	2
1957-58	25	232
1958-59	87	70
1959-60	143	226,962
1960-61	77	5,704

*Figures from 1957-58 are in calendar year.

Consumption.—The imports and exports of matches have been negligible during the Plan period. The actual consumption of matches may therefore be considered approximately to correspond to production in the country. On this basis it may be estimated that the domestic consumption of matches has increased from about 34 million gross boxes in 1955-56 to about 37·5 million gross boxes in 1960-61 (in terms of sixties). The average consumption during the Plan period works out to about 35·5 million gross boxes per annum and the average annual increase has been about 2 per cent.

Problems of the industry.—The supplies of matchwood are causing some concern to the industry. The availability of timber in private lands suitable for match manufacture has been depleted considerably. As a result, the industry has to tap the interior forest resources until the trees in the nearby area grew up again to maturity. Due to the non-availability of timber on the main land, the industry has now to rely more and more on deliveries from Andamans to meet its immediate requirements of timber. Even in the case of Andamans' timber, considerable difficulties are being experienced because of non-placement of ships for transport of timber from Andamans leading to deterioration of timber and erratic supplies. Similar transport difficulties are experienced in the mainland on account of shortage of rolling stock and the comparatively low priority for the movement of timber.

II. Programmes of Development in the Third Plan:

Estimated requirements.—The present demand for matches is estimated to be of the order of 37·5 million gross boxes (in term of sixties).

It is difficult to make an accurate forecast of the demand for matches by the end of the Third Plan period. The average increase in demand during the Second Plan period was 2% per annum—which roughly corresponds to the rate of growth of population. Considering the inelastic nature of the demand for this item and not very bright future of exports, the demand may be expected to grow during the Third Plan more or less on the basis of the past trend. On this assumption, the demand for matches may be estimated at about 42 million gross boxes of sixties by 1965-66.

Target of capacity and production.—The demand for matches is estimated at 42 million gross boxes by 1965-66. With a view to achieving self sufficiency, production of the same order by 1965-66 is envisaged. The

present annual capacity of 45·3 million gross boxes seems to be adequate in relation to the estimated demand and it may therefore seem unnecessary to increase the capacity of the industry further during the Third Plan period. Since, however almost the entire additional production is expected to come from the cottage sector where the units do not operate for the entire year nor work to full capacity, the setting up of additional cottage units need not be discouraged. No large-scale units need however, be established during the Third Plan period.

Programme for the development of the match industry in the cottage sector.—Cottage match industry comes within the purview of the activities of the Khadi & Village Industries Commission. During the Second Plan period, the programme of the Commission did not proceed satisfactorily and of the 467 'D' class factories sanctioned during the Second Plan, only 70 factories are working now. These will be continued in the Third Plan period. Besides, the plan formulated by the Khadi and Village Industries Commission for the next 5 years includes establishment of 200 new 'D' class factories.

Requirements of raw materials.—The principal raw materials of the match industry are matchwood, potassium chlorate, red phosphorous, sulphur, match paper and glue. The requirements of these raw materials for a production of 42 million gross boxes are estimated to be as follows:

	(tons)
Matchwood	168,000
Potassium chlorate	3,800
Sulphur	430
Phosphorous (amorphous)	290
Match paper	4,600
Glue	770

Of the above raw materials, the entire requirements of red phosphorous and part of the requirements of sulphur will be met by imports. The other raw materials are expected to be available indigenously.

With a view to achieving self-sufficiency in matchwood, planned efforts are necessary to raise plantations of matchwood species. Some progress in the plantation of matchwood species has already been made. The Central Government has been offering 50% subsidy towards expenditure on matchwood plantations undertaken by the State Governments. It has been decided that the present practice should be continued and that the expenditure involved will be shared by the State Governments and the Central Government on a 50:50 basis. New plantations extending over an area of about 80,000 acres were undertaken during the First and Second Plans. During the Third Plan period it is proposed to increase the acreage by 60,000.

The following table summaries the development programme of the match industry during the period of the Third Plan:

	1960-61	1965-66
Annual rated capacity (million gross boxes)	45·3	45·3
Production (million gross boxes)	37·5	42·0

68. PLYWOOD, FIBREBOARD AND PARTICLE BOARD

A. PLYWOOD

1. Review of Progress in the Second Plan:

Targets.—At the commencement of the Second Plan the annual capacity of the plywood industry was estimated at about 150·6 million sq. ft. The schemes which had already been licensed were on their implementation expected to increase the capacity of the industry to about 167·5 million sq. ft. which was recommended as the capacity target for 1960-61.

The demand for tea-chest plywood at the beginning of the Second Plan was estimated at 90 million sq. ft. while that of commercial plywood at 20 million sq. ft. It was envisaged that the demand for tea-chest would increase to 100 million sq. ft. and that for commercial plywood to between 30 to 50 million sq. ft. by 1960-61.

As against the targets indicated above, the capacity and production levels estimated to have been reached by the end of the Second Plan are set forth in the following paragraphs.

Capacity and production.—At the beginning of the Second Plan there were 64 plywood factories on the approved list of the Development Wing of the Ministry of Commerce and Industry. Since then two new units have gone into production and two of the existing units have completed their expansion programmes. Details of these are given below:

Name of the firm	Nature of the Scheme	Location	Annual additional capacity (million sq.ft.)
M/s. Woodcrafts (Assam) Ltd,	N. U.	Mariani (Assam)	5·5
M/s. Bharat Plywood & Timber Products Ltd.	Do.	Mangalore (Mysore)	6·0
M/s. Western India Plywood Ltd.	S. E.	Baliapatam (Kerala)	2·4
M/s. Albion Plywood Ltd.	Do.	Calcutta	5·4

In addition, seven units which were previously operating in the small scale sector have been brought on the approved list of the Development Wing. One unit in Assam which ceased production in 1952, was removed from the approved list. Thus, there are at present 72 factories on the list of the Development Wing. Out of these 42 are authorised to manufacture both tea-chest and commercial plywood, 27 tea-chest plywood exclusively and 3 commercial plywood only.

The installed capacity of the industry which was estimated at 150·6 million sq. ft. in April 1956 has, however, been reassessed by the Development Wing and has been placed at 140·4 million sq. ft. on single shift. Though the overall installed capacity has been assessed at this figure, the capacity authorised by the Development Wing on the basis of the equipment with the units and facilities for multiple shift operation is 201·05 million sq. ft. and 152·18 million sq. ft. for tea-chest plywood and commercial plywood respectively.

The State-wise distribution of the industry as on 1-4-61 is as given below:

(million sq. ft.)

State	No. of units	Annual assessed capacity on single shift	Capacity authorised for tea-chest plywood	Capacity authorised for commercial plywood
Assam	18	39·31	63·66	34·31
West Bengal	34	47·31	73·77	51·27
Kerala	13	35·10	47·54	33·62
Mysore	5	15·64	14·97	26·62
Bihar	1	1·04	1·11	0·36
Uttar Pradesh	1	2·00	..	6·00
TOTAL	72	140·40	201·05	152·18

In addition, according to the Development Commissioner for Small Scale Industries, there are about 63 small scale factories in West Bengal, Punjab, U. P., Mysore and Kerala. Complete and reliable statistical data on the capacity and production of these units are however, not available.

The production of tea-chest plywood and commercial plywood in the year 1955-56 and during the Second Plan period has been as follows:

(million sq.ft.)

	Tea-chest	Commercial
1955-56	93·5	20·7
1956-57	99·0	27·8
1957-58	90·8	32·6
1958-59	90·0	44·1
1959-60	98·8	55·1
1960-61	98·2	62·5

It will be seen from these figures that the production of tea-chest plywood declined from 99 million sq. ft. in 1956-57 to about 90 million sq. ft. in the two subsequent years and increased to 98·8 million sq. ft. in 1959-60. Production in 1960-61 again showed a slight decrease and was 98.2 million sq. ft. The fall in the production of tea-chest plywood in the years

1957-58 and 1958-59 was mainly due to low off take by the tea industry Shortage of timber and inadequacy of transport facilities especially in the case of factories situated in West Bengal were the other factors which contributed to a fall in production during this period.

The production of commercial plywood on the other hand has shown a considerable increase having almost tripled during the Second Plan period.

During the Second Plan period the industry has diversified its production by undertaking the manufacture of decorative plywood, marine plywood and medium strength aircraft plywood. The last two are manufactured only against orders. Figures of production of these three types of plywood are not separately available.

Consumption

(i) *Tea-chest.*—The consumption of tea-chest plywood on the basis of production plus imports (exports have been insignificant) during the last few years is given below:

(million sq. ft.)

	Production	Imports	Consumption
1955-56	93·5	3·0	96·5
1956-57	99·0	4·3	103·3
1957-58	90·8	2·6*	93·4
1958-59	90·0	neg.	90·0
1959-60	98·8	neg.	98·8
1960-61	98·2	..	98·2

*for calendar year 1957.

Since the licensing period July-September, 1957, import of tea-chest and parts and fittings thereof has been totally banned.

As mentioned ealier, the low off take in the years 1957-58 and 1958-59 is accounted for by a recession in the tea trade. Since then the consumption has gone up and is estimated to be about 98 million sq. ft. in 1960-61 which is slightly short of the demand estimate of 100 million sq. ft.

(ii) *Commercial plywood.*—There has been no significant imports of commercial plywood and exports have been in very small quantities. From the figures of domestic production it appears that the consumption of commercial plywood increased from 20·7 million sq. ft. in 1955-56 to about 62·5 million sq. ft. in 1960-61 and has thus exceeded the estimated demand of 30-35 million sq. ft.

Capital investment.—Capital investment of the order of Rs. 1·5 crores is estimated to have been made in the plywood industry during the Second Plan period.

Quality.—The quality of indigenous tea-chest plywood is reported to have shown vast improvement since the introduction of the compulsory inspection schemes and to be in no way inferior to that of the imported product.

Tea is at present allowed to be packed for exports in chests which have been inspected by the Development Wing and stamped with either I. S. I. Mark in the case of licensed units or with the Development Wing stamp in the case of non-licensed units. So far about 60 plywood factories have been granted licences under the Certification Act of the I. S. I. It is expected that within another two years all the plywood units would obtain licences under the I. S. I. Certification Mark Scheme.

Major developments in the industry.—The Government have discontinued protection to the plywood industry with effect from 1st January, 1961. This is in accordance with the main recommendation of the Tariff Commission, which submitted its report on continuance of protection to this industry in September, 1960.

In order to help the industry to export its products several measures have been taken by Government. Plywood has been specified as an article of export in Trade Agreements with certain countries namely Indonesia, Yugoslavia, Afghanistan and Hungary. Exporting factories have been granted exemption from voluntary cess imposed by the plywood factories on the quantity of plywood exported by them. Government have also allowed a drawback of the custom duty paid on the imported raw materials and the central excise duty paid on the excisable raw material used in the manufacture of plywood exported from India. Further with a view to assisting the industry, the Railway Board has approved concessional freight rates from certain stations to specified ports.

It has been decided to set up a Research Association known as the Indian Plywood Manufacturers Research Association for conducting research in the plywood industry in cooperation with Council of Scientific & Industrial Research. Under its aegis it is further proposed to set up a research laboratory at Bangalore and a field station at Calcutta. The funds collected from the voluntary cess are proposed to be utilised for these.

Problems of the industry.—Considerable difficulties are still being experienced by the industry in procuring adequate quantities of timber especially by the factories situated in Calcutta. The supply of timber from the Andamans, which is the main source of supply for these factories has continued to be erratic and unsatisfactory mainly on account of transport difficulties. There are also persistent complaints regarding the quality and price of Andaman Timber. Failure to adopt the prophylactic measures after the timber is felled has lead to considerable wastage of valuable timber which becomes thoroughly unsuitable for peeling. This has resulted in increasing the cost of production of the plywood factories.

II. Programme of Development in the Third Plan:

Estimated requirements

(i) *Tea-chest plywood.*—As already mentioned the consumption of tea-chest plywood at present is estimated at about 98 million sq. ft. The demand for tea-chest plywood is closely related to the production of tea. It is estimated that the production of tea will increase from about 725 millions lbs. in 1960-61 to 900 million lbs. by the end of the Third Plan period. Since only a moderate increase of a little over 24 per cent is expected in the production of tea during the Third Plan period, it is estimated that the demand for tea-chest plywood will not go up very greatly and may rise from 98 to about 125 million sq. ft. by 1965-66.

The present exports of tea-chests are of the orders of 0·5 million sq. ft. With intensive efforts to popularise Indian tea-chest in foreign countries and a reduction in prices, exports may rise to about 5 million sq. ft. by 1965-66. Thus, on these estimates the total demand for tea-chest plywood both for internal consumption and export would not be more than 130 million sq. ft. by the end of the Third Plan period.

(ii) *Commercial plywood.*—It is difficult to forecast the future demand for commercial plywood with any reasonable accuracy. Though the demand has been steadily increasing in the last few years, it is necessary to take into account in estimating the future demand the competition that commercial plywood will shortly encounter from similar products like fibreboard. Till now fibreboard has not been produced in the country in any large quantity, but recently factories for its production have been established. Further a number of schemes fo rthe manufacture of the fibreboard have been licensed. When these factories commence regular production, a substantial proportion of the requirements which are at present met by the commercial plywood industry, may be met by the fibreboard industry. In the circumstances, the domestic demand for commercial plywood probably may not increase to more than 80-100 million sq. ft. by the end of the Third Plan period.

A small quantity of commercial plywood is at present exported. It is expected that with an improvement in sale and advertising techniques, it should be possible to export about 10 million sq. ft. of commercial plywood by 1965-66. The demand for commercial plywood can, thus, be placed at 90-110 million sq. ft. by 1965-66.

Targets of capacity and production.—Since the total demand for tea-chest and commercial plywood is estimated at 220 to 240 million sq. ft. by 1965-66 production of the same order is envisaged by that period. It will be possible to achieve this with a capacity of about 340 million sq. ft. based on multiple shift or say 168·39 million sq. ft. based on single shift. However, since this industry is capable of being developed in all regions where the raw materials are available there may be a case for somewhat

exceeding the target of 168·39 million sq. ft. in special circumstances. Further, the shifting of existing factories to better locations and expansion of uneconomic units to an economic size will also have to be considered favourably. There is considerable surplus tea-chest capacity in the country. Tea-chest plywood producers who may wish to take to the production of commercial plywood within their overall capacity may, therefore, be permitted to do so.

Schemes licensed and under implementation.—A number of schemes for the manufacture of plywood with a total capacity of the order of 83·976 million sq. ft. per annum on triple shift or 27·99 million sq. ft. on single shift have been licensed or recommended for licence under the Industries Act. Details of these schemes are given in Annexure I at the end. If all these schemes were to be implemented, the capacity of the industry would increase to 168·39 million sq. ft. on single shift. However, due to shortage of foreign exchange and other difficulties, it is unlikely that all the licensed schemes will materialise by the end of the Third Plan period. Even so in view of the large capacity already licensed, it would seem that there is no need to license further schemes in the near future.

Investment and employment.—It is estimated that a sum of about Rs. 2 crores will have to be invested in the plywood industry during the Third Plan period to achieve the capacity target mentioned above. The foreign exchange component of this investment is placed at about Rs. 1·0 crore.

The expansion of the industry is estimated to provide employment to about 6,000 additional persons.

Requirements of raw materials.—The principal raw materials required for the manufacture of plywood are timber and adhesives. As regards the latter, there has recently been a rapid switch-over from casein glue to synthetic resins based on urea formaldehyde and phenol formaldehyde. Urea formaldehyde resin is odourless and is, therefore, preferred for tea-chest plywood. Both urea formaldehyde and phenol formaldehyde adhesives are used in the manufacture of commercial plywood.

The requirement of synthetic resins for the plywood industry estimated currently at 3,500 tons per year in terms of liquid are mostly met by imports. On the basis of production target envisaged for 1965-66 it is estimated that the demand for this raw material will be about 5,800 tons by 1965-66. A number of schemes have been licensed or recommended for licence under the Industries Act for the manufacture of synthetic resins. One unit in Calcutta with a capacity of 2,160 tons per annum has already gone into production. It is expected that the industry will be self-sufficient in regard to this raw material by the end of the Third Plan period. The requirements of timber for a production of 240 million sq. ft. of tea-chest and commercial plywood is estimated at 240,000 tons.

The following table summarises the development of the plywood industry envisaged during the Third Plan:

	1960-61		1965-66	
	Installed capacity (on single shift)	Production	Installed capacity (on single shift)	Production
Tea-chest plywood (million sq. ft.)	140·40	98·2	168·39	130·0
Commercial plywood (million sq. ft.)		62·5		90—110
Exports				
Tea-chest plywood (million sq. ft.)	Neg.		5·0	
Commercial plywood (million. sq. ft.)	Neg.		10·0	

(B) Fibreboard (Hard and Insulation Board)

Fibreboard is a general term applied to sheet materials of various densities manufactured from wood and other vegetable fibres. Fibreboard can be classified in two broad categories—hardboard and insulation boards. The former is "compressed" board and the latter "non-compressed" board.

Capacity.—Fibreboard was not manufactured in the country at the beginning of the Second Plan but certain schemes for its manufacture were under execution at that time. With the completion of the following three new schemes during the Second Plan period, production of fibreboard (hard and insulation board) has started for the first time in the country.

Name of the Unit	Location	Name of the product	Annual capacity (million Sq. ft.)
M/s. Anil Hardboard	Maharashtra	Hardboard	18·0
M/s. Western India Plywood Ltd.	Baliapatam (Kerala).	Hardboard	11·25
M/s. Baranagore Jute Factory	Calcutta	Jute based insulation board.	1·08

There are therefore, at present three units in the country manufacturing fibreboard (hardboard and insulation board) with an annual capacity of 30·33 million sq. ft.

Consumption.—It was estimated in the development programme of plywood industry for the Second Plan that the demand for fibreboard by 1960-61 would be of the order of 40 to 50 million sq. ft.

The estimated consumption of fibreboard in recent years has been as given below:

(million sq. ft.)

	Production	Imports	Consumption
1957	..	12·9	12·9
1958	..	5·4	5·4
1959	12·7	1·0	13·7
1960	18·0	0·2	18·2

As already mentioned, production of fibreboard has started only recently and prior to 1957 the requirements were being met by imports. Import figures of fibreboard were not separately recorded in the Sea Borne Trade Accounts before 1957 and therefore, it is rather difficult to estimate the consumption of these boards in earlier years. Since then it has not been possible to meet the demand for these boards in full on account of restrictions imposed on their import from 1957 onwards. It is considered that the consumption has been a good deal below the real demand and that if fibreboard had been available in sufficient quantities the demand would in all probability have increased to 40 to 50 million sq. ft. by 1960-61 as envisaged in the Plan.

Capital investment.—A sum of about Rs. 1·5 crores is estimated to have been invested in the fibreboard industry during the Second Plan period.

Programme of Development in the Third Plan:

Estimated requirements.—Fibreboard is produced out of wood waste, sawmill waste and forest management waste and other materials like jute mill waste and sugar cane bagasse which at present remains for the most part unutilised. If fibreboard is given a superior finish and appearance, it can be economic and attractive substitute for the conventional furniture and constructional materials. Its use in building and construction industries for false ceilings, partitions, panelling, air conditioning ducts panels in passenger railway coaches and in buses is reported to be on the increase. In the furniture and packaging industries also there is a scope for its increased use. It would, therefore, seem reasonable to assume a 100 per cent. increase by 1965-66 over the level of demand estimated to have been reached at the end of the Second Plan. On this basis the demand for fibreboard would be of the order of 80 to 100 million sq. ft. by 1965-66.

Fibreboard is not at present, exported and the possibilities in this regard have still be explored. In the circumstances, no separate provision for export of this board is at present suggested.

Targets of capacity and production.—Since the demand for fibreboard is estimated to increase to 80 to 100 million sq. ft. by 1965-66, production of the same order is envisaged by that period. It would be possible to achieve

production to this extent with a capacity of about 125 million sq. ft. However, since this capacity is capable of being developed on a regional basis, capacity above 125 million sq. ft. can be considered in special circumstances.

Schemes licensed and under implementation.—Licences under the Industries Act have been given to a number of schemes for the manufacture of fibreboard, which when implemented will increase the capacity of the industry to 141·66 million sq. ft. per annum comprised of 121·50 million sq. ft. of hardboard, 20·16 million sq. ft. of insulation board. Details of all the licensed schemes are given in Annexure II. However due to foreign exchange and other difficulties these schemes have not made much progress. The Capital Goods Committee has so far only given clearance for import of capital goods so as to bring the capacity upto about 65·25 million sq. ft. For the present more than sufficient capacity has been licensed for this industry and it is not necessary to license any further capacity in the near future.

Capital investment.—It is estimated that a sum of Rs. 3 crores will have to be invested in the fibreboard industry during the Third Plan period to achieve the capacity target of 125 million sq. ft. by 1965-66. The foreign exchange component of this investment is placed at about Rs. 1·8 crores.

The expansion of the industry is estimated to provide employment to about 500 persons of all categories.

Requirements of raw materials.—The raw materials required for the industry, are wood residue resulting from forest management, saw milling and plywood manufacture and miscellaneous chemicals like paraffin, oleic acid, ammonia, alum etc. All these raw materials are expected to be available indigenously.

The following table summarises the development of the fibreboard industry during the Third Plan period:

	1960-61	1965-66
Annual installed capacity (million sq. ft.) .	30·33	125·0
Production (million sq. ft.)	18·00	80—100

C. Particle Board (Chipboard)

In recent years the manufacture of a new type of wood based board material known as particle board has developed at a very fast pace in some of the advanced countries. Particle board may be defined as a sheet material

manufactured from small particles or pieces of wood or other lignocellulosic materials *e.g.* chips, flakes, splinters, strands and sieves etc. agglomorated by use of organic binders, together with one or more of the following agents; heat pressure, humidity, catalyst etc. Industrial wood residues, logging and forest management wastes and residues etc. which have not been exploited so far and have low economic value, can be profitably converted into particle board.

Particle board is a very versatile board material and among others can be used in place of solid timber in the manufacture of furniture. Medium density particle board can be used as panel material for walls and ceiling interiors in houses, railway carriages and ships etc. Low density particle board can find its use as an insulating material.

There is at present only one unit in the country *viz.*, M/s. Plywood Products, Sitapur (U.P.) producing particle board with an annual capacity of 6 million sq. ft. Their production in 1960 was 794,868 sq. ft. Licences under the Industries Act have been given to a number of schemes which on their implementation will increase the capacity of the industry to 19·5 million sq. ft. per annum. Details of these schemes are given in Annexure III. It is somewhat difficult to estimate the probable demand for particle board in the country but in view of the rising shortfall in supply of timber it is expected to be quite high.

The manufacture of particle board is a significant development in the country and the progress of this industry during the Third Plan will be an important aspect of timber based industries.

ANNEXURE I

Schemes licensed/recommended under the Industries (Development & Regulation) Act for the manufacture of Plywood.

Name of the firm	Nature of Scheme	Additional capacity licensed (million sq.ft.)	Name of the Product
M/s. P. C. Ray & Co., Calcutta . .	New unit .	15·00	Both tea-chest and commercial.
M/s. Andaman Timber Industries, Calcutta.	Do.	6.00	Do.
M/s. Andaman Timber Corporation, Andamans.	Do.	2.28	Do.
M/s. Woodcraft Product, Jeypore, Assam.	Substantial expansion.	12·0	Commercial plywood.
M/s. Assam Bengal Veneer Industries, Calcutta.	Do. .	2·416	Do.
M/s. B. S. & Co., Calcutta. . . .	Do. .	1·92	Do.
M/s. Jayshree Plywoods, Calcutta. .	Substantial expansion.	8·36	Do.
M/s. Veneer Mills, Tinsukia. . .	Do. .	12·00	Do.
M/s. Daven Port & Co., Calcutta. .	New unit .	12·00	Do.
M/s. Subarnarekha & Ban Udyog, Calcutta.	Do. .	12·00	Do.
	TOTAL .	83·976	

ANNEXURE II

Schemes licensed or recommended for licence for the manufacture of Fibre-board (Hardboard and Insulation Board).

Name of the firm	Nature of scheme	Location	Name of the product	Annual capacity (million Sq.ft.)
M/s. *Anil Hardboards, Bombay	New unit	Bombay	Hardboard	18·0
M/s. *Anil Hardboards, Bombay	Expansion	Bombay	Hardboard	[18·0]
M/s. *Anil Hardboards, Bombay	New article	Bombay	Insulation board	18·0
M/s. *Western India Plywoods, Baliapatam,	New unit	Kerala	Hardboard	11·25
M/s. *Western India Plywoods, Baliapatam.	Expansion	Kerala	Hardboard	11.25
M/s. National Saw & Plywood (Assam Hardboards), Calcutta.	New unit	Gauhati (Assam).	Hardboard	45·0
M/s. Madhya Pradesh Industries, Bhopal.	New unit	Bhopal (M.P.)	Hardboard	18·0
M/s. †Barnagore Jute Factory, Calcutta.	New unit	Calcutta	Jute based insulation board.	2.16
		TOTAL		141·66

*These units have gone into production.

†Part of the capacity of this unit has come into existence.

ANNEXURE III

List of particle board Schemes so far Licensed

Name of the firm	Location	Capacity million sq.ft.
1	2	3
M/s. Plywood Products, Sitapur, U.P.*	Sitapur.	6·0
M/s. Bharat Plywood & Timber Products, Cannanore.	Kerala.	2.5
M/s. Andaman Timber Industries	Calcutta.	1·2
M/s. Albion Plywoods Ltd.	24 Parganas, W. Bengal.	1·2
M/s. Arthur Import Export	Bombay.	2·7
M/s. Upper India Chipboard Industries	Jeypore (Assam).	3·0
M/s. Indian Plywood Mfg. Co.	Dandeli (Mysore).	8·5
M/s. Particle Board Corporation	Surat (Gujarat).	7·2
M/s. Assam Chipboard Mfg. Co.	Assam.	1·2
M/s. B. S. & Co.	Calcutta.	2·4
M/s. S. N. Khaitan	Andhra Pradesh.	6·0
M/s. Jolly Brothers	Bombay.	6·0
M/s. Nuboard Manufacturing Co.	Bareilly (U.P.).	7·2
M/s. Mysore Chipboard Ltd.	Mysore.	7·5
M/s. Woodcraft Products	Jeypore (Assam).	1·7
M/s. Vindhya-Wasini Industries Corporation Ltd.	Jabalpur.	7·488
M/s. United Province Sugar Co.	Deoria (U.P.).	15·0
M/s. Madhosons	Dehra Dun (U.P.).	1·7
M/s. Assam Bengal Veneer Industries	Godlabari (W. Bengal).	1·5
M/s. Purtabpore Co. Ltd.	Deoria (U.P.).	18·0
M/s. Woodcraft Assam Ltd.	Mariani (Assam).	1·7
M/s. Mehrotra & Co.	Bareilly (U.P.).	6·75
M/s. Sunderdas & Co.	Warangal (Andhra Pradesh).	19·2
M/s. N. R. Krishnama Raja	Rajapalayam (Madras).	1·7
M/s. Thakorlal Hiralal & Co. Ltd.	Balasore (Orissa).	12·6

*This unit has gone into productions.

1	2	3
M/s. Shri M. N. Ramakrishan Industrial Aids International,	Kottayam. (Kerala)	8·64
M/s. Technoequip Co.	Bombay.	3·53
M/s. U. K. Bardiya & Co.	Maharashtra.	7·488
M/s. Asian Industries Corporation, Bombay . . .	Mysore.	16·2
M/s. Shri R. G. Sahria, Calcutta	Rajasthan.	7·2
M/s. Melamine & Fibreboards Ltd., Ahmedabad . .	Ahmedabad.	1·56
	TOTAL . . .	194·556

FOOD INDUSTRIES

69. SALT

I. Review of Progress during the Second Plan:

Targets.—The production target set for salt for 1960-61 was 100 million maunds to meet the requirements in full which included 8·0 million maunds for export.

Capacity and production.—The area under marine and inland salt works was 75,811 acres at the end of First Plan. More area was brought under salt cultivation and the total area increased to 81,378 acres in 1958. It decreased to 78,333 acres in 1959 and registered a small recovery in 1960 when the area under salt stood at 79,725 acres. The number of salt units in operation increased from 146 in 1955-56 to 166 in 1958 but came down to 153 in 1959 and remained at that level in the following year. The State-wise break up of the number of licensed units in 1960 compared to the position in 1955-56 and 1958 is given below:

State	Number of Units		
	1955-56	1958	1960
Rajasthan	4	4	4
Gujarat & Maharashtra	56	75	
Mysore	..	1	1
Madras	36	48	46
Andhra	28	26	25
Kerala	11	1	1
Orissa	6	6	8
West Bengal	4	4	5
Himachal Pradesh	1	1	1
TOTAL	146	166	153

There has been a continuous increase in the production of salt during the first three years of Second Plan, and it reached the highest level in 1958 with 1125·53 lakh maunds which is well above the Second Plan target of 1,000 lakh maunds. In the same year, the number of production units and the acreage under cultivation have also been the highest. During the following year 1959 the production came down to 851·44 lakhs maunds. This fall in output was partly due to unfavourable climatic conditions and partly

to a voluntary cut in production resorted to by the manufacturers, for reducing the large stocks carried over from 1958. The production showed again a rise of 8 per cent in 1960. The State-wise production of salt during the Second Plan period was as follows:

(lakh maunds)

State	1956	1957	1958	1959	1960
Rajasthan	79·90	93·33	99·84	80·64	81·61
Gujarat & Maharashtra	516·86	573·19	686·42	528·37	534·83
Mysore	0·35	0·99	0·82	2·15	0·84
Madras	166·78	171·92	150·55	134·05	154·16
Andhra	52·66	55·05	69·53	31·47	59·81
Kerala	0·27	0·09	0·19	0·17	0·16
Orissa	13·11	11·29	20·61	2·89	10·23
West Bengal	1·07	2·16	1·75	1·67	2·28
Himachal Pradesh	0·96	1·18	1·39	0·99	1·15
Unlincensed	57·90	74·12	94·43	68·94	76·06
TOTAL	888·86	983·32	1,125·53	851·44	920·63

Imports.—There was no import of salt into the country during the five years from 1956-61 except for some special grades *e.g.* rock salt for dairy purposes imported in very small quantities in 1956-57 and 1957-58.

Exports.—Salt is exported mainly to Japan, Maldives, East Africa and Nepal, the export to Japan being canalised through the State Trading Corporation (S.T.C.). The yearly export of salt for the period 1956 to 1960 was as shown below:

	Quantity in '000 tons	Value in Rs. lakhs
1956	307	N.A.
1957	377	62·05
1958	253	37·50
1959	341	46·50
1960	425	56·46

The fall in exports during 1958 was due to our main importer, Japan curtailing its imports from India and arranging for the bulk of its requirements from elsewhere. The imports of salt by Indonesia in 1956 and 1957

were the result of unfavourable weather conditions in that country which adversely affected salt production there. Therefore they did not continue to import in the following years.

Consumption of salt.—At the beginning of Second Plan, it was estimated that the requirements of salt by 1960-61 would be of the order of 100 million maunds or 3·67 million tons with the following break up:

	million tons
Domestic requirements	2·57
Industries	0·75
Exports	0·30
Unforeseen	0·70
TOTAL	3·67

The domestic demand was calculated on the assumption that the population of the country would reach 408 millions by 1960-61 and the *per capita* household consumption 14 lbs. per annum. Assuming the latest revised population estimate of 438 millions and based on the actual production of caustic soda, soda ash and other salt based industries, the demand pattern in 1960 has now been visualised as follows:

	million tons
Domestic consumption	2·74
Industries	0·62
Exports	0·42
TOTAL	3·78

Development of salt works.—In pursuance of the recommendation made by the Estimates Committee in their 15th Report (1954-55) a Company by the name of 'Hindustan Salt Company Ltd.' was formed and registered on 12th April, 1958, for taking over and operating, to start with, the Government Salt Works at Sambhar and Didwana in Rajasthan and at Kharaghoda in Gujarat, which were previously being managed departmentally. The company took over the above specified Government Salt Works with effect from 1st January, 1959 for the manufacture of salt and by-products as also other allied chemicals obtainable in the course of the salt production. Subsequently on expiry of the terms of lease, the Didwana Salt source in Rajasthan was surrendered from 1st April, 1960 to the State Government who have been running it since then.

The table salt plant at the Sambhar Lake has been put into commission and the production of free-flowing table salt according to the process patented by the C.S.I.R. commenced in the year 1960. Dairy salt used in the manufacture of table butter, and sodium chloride conforming to B.P. specifications are also being successfully manufactured and supplied on demand. During the Second Plan period a Committee headed by Dr. G. P. Kane was appointed by Government of India to examine and report on the recovery of sodium sulphate and sodium carbonate from the bitterns and brine of salt sources of Sambhar. Pursuant to the recommendation of the Committee in consultation with a German firm, the Company has finalised plans for improving the quality of Sambhar salt and for recovering the sodium sulphate from the washings and bitterns. The above scheme is estimated to cost Rs. 100 lakhs. About 10,000 tons of anhydrous sodium sulphate will be recovered as by-product which will be utilized mainly in the paper industry. The Rajasthan Government has taken up the installations of a pilot plant for the recovery of sodium sulphate from brine at Didwana. The capacity of the plant is 20 tons/day. The above two plants are expected to meet a part of our requirement of anhydrous sodium sulphate of the paper and sodium sulphate industries during the Third Plan period.

Iodized Salt.—Mainly for countering goitre in the hilly areas, an iodized salt pilot plant was planned at Sambhar during the First Plan with the assistance of the World Health Organisation and Directorate General of Health Services. It went into production towards the beginning of the Second Plan and is now supplying iodized salt to goitrous areas of NEFA, Kangra in the Punjab and other sub-Himalayan regions. Thus at present one pilot plant for iodization with a capacity of 5 tons per day is in operation at Sambhar Lake under the Hindustan Salt Company Ltd. Negotiations with the UNICEF for setting up another plant at the same site with a daily capacity of 70 tons were completed and the required plant and equipment were being installed by the close of the Second plan. Both potassium iodide and potassium iodate in the ratio of 1:50,000 and 1:40,000 are used for the preparation of iodised salt.

Mandi Salt Mines.—The salt mines of Mandi are the only source of rock salt so far known in India with a view to their scientific exploitation, a scheme for sinking two shafts at Drang had been approved earlier. The electrification of Drang mines and Guma mines has been completed. The work of shaft sinking was expected to be completed during 1960-61 but it has not been possible to complete the work according to schedule due to some technical difficulty in the selection of proper site for shaft sinking. Further steps are also under consideration for increasing substantially the output of salt from Mandi mines.

Sisirganj Training-cum-Production Centre.—A scheme for establishing a training-cum-production centre at Sisirganj in West Bengal at an estimated cost of Rs. 58,000 was sanctioned in 1959. On its establishment this centre will be fully equipped for demonstrating the proper methods of salt manufacture. Another objective of this scheme is to foster the development of the salt industry in West Bengal, particularly in the vast Sunderban area. As the site selected for the centre could not be made available by the State Government, the work could not be commenced.

Private sector.—Various schemes taken in hand for construction of new roads and improvement of existing roads, brine supply channels, improvement of platforms, drying grounds wharfs, storage sheds and embankments, silt clearance, amenities for staff and labour such as medical facilities, labour rest shelters, schools for children, water for drinking purposes etc. were in progress at the end of the Second Plan.

Improvement in quality of salt.—The standard for purity of edible salt, which was raised from 94% to 95% sodium chloride, content in January 1957, was maintained at that level during the later part of the Second Plan. It was originally proposed to establish 20 test laboratories during the Second Plan period to be located in the various salt producing regions in the country. Towards the end of 1957, when it was decided that the prescribed standard of quality of salt should not be enforced by compulsion, but allowed to grow in the normal course, the progress in the setting up of test laboratories was slowed down.

At the end of the First Plan, there was a model farm at Wadala, Bombay. During the Second plan period, two more model farms were established; one at Sumadi (Orissa) and the other at Tuticorin (Madras). Farms at Sumadi and Wadala are run by the Salt Department whereas the Tuticorin farm is run by private manufacturers. The model farms have fulfilled the purpose of successfully demonstrating the manufacture of high purity edible salt by systematic methods and many private salt manufacturers have benefited by them. The problem of recovery of potassium chloride from sea bitterns is now taken up by the model farms.

Enquiry into salt industry.—In January, 1958 the Government of India appointed a Committee for conducting a comprehensive survey to ascertain full facts and data relating to the various aspects and problems of the salt industry with a view to devising measures to eliminate anamolies, if any, detrimental to the growth of industry.

The terms of reference of the Committee are;

(a) to assess the production of large, medium and small-scale manufacturers of salt;

(b) to review the concessions allowed to salt manufacturers with a view to ascertaining whether and to what extent such concessions have helped in the development of salt industry;

(c) to find out whether small manufacturers of salt experienced any practical difficulties calling for assistance;

(d) to examine whether the statutory provisions such as those in the Minimum Wages Act can be made use of to help the labour employed in the salt industry;

(e) to assess the progress made in recent years in the organisation of cooperatives in the salt industry and other matters allied thereto with a view to encouraging the growth of cooperative societies for the manufacture of salt; and

(f) to examine the existing system of quality control of salt keeping in view the difficulties of manufacturers and the requirements of the consumers including those of the salt-based industries and export markets.

Some of the important recommendations and conclusions made by the Committee are:

(i) Consumption of salt for industrial purposes is likely to increase in the Third Plan period and therefore, special efforts may be needed to increase production further to meet the anticipated demand;

(ii) It is necessary to provide the chemical industry with salt of suitable high degree of purity. Therefore, production of salt of as high a purity as possible for industrial requirements should be encouraged;

(iii) It is necessary to provide facilities for production of special varieties of salt like for example table salt, iodized salt and salt of special grades and specifications required for the dairy and food industries;

(iv) An autonomous Central Salt Board should be set up for sanctioning and executing schemes relating to development works of the Salt Department. This Board should also be entrusted with the responsibility of welfare schemes of salt labour as also for the grant of financial help in the form of loans to salt manufacturers;

(v) Special assistance should be given to salt manufacturers in the matter of export of salt and a Committee should be set up to draw up a suitable scheme for export promotion;

(vi) A 'Salt Development Fund' to be administered by the proposed Central Salt Board should be instituted for giving loans to cooperatives as well as other deserving manufacturers of salt and to improve the standard of amenities provided for labour employed in the salt industry;

(vii) Cooperative societies of salt manufacturers should be greatly encouraged and gradually more and more salt works should be brought under the cooperative fold. Salt cooperatives should be given loans from the proposed 'Salt Development Fund' and be also eligible for grants from the Salt Department. They should be given Government land in preference to other manufacturers and on concessional terms;

(viii) All manufacturers of salt in the country should try to attain the I.S.I. standard of 90% of sodium chloride for edible salt;

(ix) The Indian Standard Institution should be requested to draw up a revised standard for salt required for hide curing having regard to the standards laid down in other countries; and

(x) Large-scale salt manufacturers should be encouraged to effect recovery of by-products of salt. No royalty should be charged on such by-products.

Action taken on Committee's Recommendations.—The Government of India had considered the Committee's recommendations and have accepted them in principle. The following steps have been taken to carry out the recommendations:

(a) Necessary measures are being adopted to set up an autonomous Central Salt Board;

(b) State Trading Corporation was being entrusted with the work of promoting export of salt and therefore, it was considered that no separate Committee need be set up for this purpose;

(c) *By-products.*—The Central Advisory Board for Salt recommended that the licensees of the big saltworks should be persuaded to invariably take up the separation of gypsum and recovery of potassium chloride. The response to this recommendation, particularly in respect of recovery of gypsum which is now being undertaken in almost all the major salt works on the West Coast and Tuticorin, has been encouraging. The Salt Department has been exploring the possibilities of developing other by-products as well. The CSIR has sanctioned a pilot plant scheme for the manufacture of potassium chloride from sea bitterns at the Central Salt Research Institute, Bhavnagar during the Second Five Year Plan period. A scheme for the recovery of potassium chloride at Tuticorin has been finalised in cooperation with the State Trading Corporation and Central Salt Research Institute, Bhavnagar for producing about 1,100 tons of potassium chloride annually. The extension of the scheme to the major salt works in Gujarat and Maharashtra is also under consideration.

By-products.—The following quantities of various by-products were recovered during the last few years:

(Figure in tons)

	Gypsum	Magnesium sulphate	Magnesium chloride	Potassium Chloride
1958	37,245	632	6,417	10
1959	18,656	705	6,450	16
1960	16,601	117	5,685	15

In addition, small quantities of anhydrous sodium sulphate are recovered at Sambhar Salt Works by the processing of pan crust.

Cooperative societies.—The Salt Department has been following the policy of giving all possible encouragement to the promotion of cooperative societies of small-scale manufacturers. It has been observed that the following practical difficulties often stood in the way of formation of new cooperatives:

(a) Competition from locally organised factories;

(b) Lack of appreciation of the benefits of cooperative efforts;

(c) Scattered holdings of small licensees;

(d) Lack of trained personnel and leadership for cooperatives; and

(e) Lack of finances etc.

Due to all these considerations, the progress in the formation of co-operatives has not been encouraging as is shown in the following table:

	No. of Cooperatives formed
1956-57	4
1957-58	5
1958-59	2
1959-60	Nil
1960-61	3

Investment.—An amount of Rs. 189 lakhs was provided for expenditure during the Second Plan period for development works in the salt industry including Rs. 122 lakhs for private sector. Out of this total provision, the expenditure by the Salt Department on Government and private salt works during 1956-61 is estimated to be Rs. 43·75 lakhs. It does not include the expenditure incurred by the private manufacturers. The shortfall in expenditure is mainly due to economy drive following the Re-appraisal of the Second Five Year Plan in 1957-58.

Programme of Development in the Third Plan:

Estimated requirements.—Salt is required for edible purposes and for chemical industries as a raw material. The important consuming industries are caustic soda and soda ash. Salt is also used in food processing, fish preservation, cattle feed, in the dairy and food industries, for treatment of hides and skins and for various other purposes. On the basis of targets fixed for caustic soda and soda ash and the estimated increase in population to 480 million by 1965-66, the requirements of salt may be assessed as follows:

	million tons
For edible purpose at the rate of 15 lbs. per head	3·20
For caustic soda and soda ash industries	1·70
For other industries	
For exports	0·50
TOTAL	5·40

Targets for the Third Plan.—To meet the internal requirements and the requirements for exports, the targets for capacity and production have been fixed at 6·5 million tons and 5·4 million tons respectively by 1965-66. The

State-wise break-up of the target of production is expected to be finalised in the course of the first year of the plan. Care will be taken to ensure that Salt supplied to Industrial consumers will be of the appropriate high quality. For this purpose, new salt works to be established will have to be mechanised and it will be necessary to provide for salt washeries in such works.

Development of existing salt works.—The allocation of Rs. 3·0 crores in the public sector for the Third Plan is proposed to be utilised for the following schemes:

(i) *Mandi Salt Mines.*—A provision of Rs. 1 crore has been made in the Third Plan period for the development of Mandi Salt Mines on wet mining basis as recommended in the Eacher Wyss Report. To begin with, it is proposed to continue further with dry mining and later on to change over to wet mining. Therefore a substantial portion of the above provision will be spent in the later part of the Third Plan.

(ii) *Hindustan Salt Company.*—A washery-cum-Sodium Sulphate Recovery Plant at Sambhar Lake (and another washery at Kharaghoda) is being installed with a provision of Rs. 1 crore during the Third Plan. These projects are of considerable urgency and importance to chemical industry. The scheme envisages the manufacture of high grade quality salt for use in Chemical industry and the recovery of sodium sulphate from washings and bitterns.

(iii) A provision of Rs. 1 crore has also been made for assistance from the cess fund for the execution of development works in private salt factories, *e.g.* de-siltation of brine supply channels, provision of common services, improvement of communication etc. Projects which are designed to augment the production in these private salt factories will be given priority.

The existing production is about 3·5 million tons. The increase under (i), (ii) and (iii) is estimated at about 20% *i.e.* an additional 7 to 8 lakh tons. Necessary steps and measures have to be taken to increase the production to 5·4 million tons so as to fully meet the requirements during the Third Plan.

Investment and employment.—An overall provision of Rs. 9 crores including Rs. 2 crores as the foreign exchange component has been envisaged for investment on salt industry during the Third Plan period. The additional employment in the industry on the basis of production targets recommended will be for 30,000 persons.

The table below summarises the programme of development for the salt industry during the Third Plan:

	million tons	
	1960-61	1965-66
Capacity	3·8	6·5
Production	3·4	5·4

70. SUGAR

I. Review of Progress in the Second Plan:

Targets.—On the recommendation of the Development Council for Sugar Industry, the Planning Commission fixed the targets of capacity and production to be achieved by 1960-61 at 2·50 million tons and 2·25 million tons of sugar respectively. The latter figure was linked with the estimated domestic requirements for sugar in the final year of the Plan.

Capacity and production.—In April 1956, there were 147 sugar factories registered under the Industries (Development and Regulation) Act with an annual capacity of about 1·69 million tons of sugar. In addition, there were 13 factories with a capacity of about 51,000 tons per annum which had been lying idle for several years and had, therefore, never been registered under the Industries Act. During the first four years of the Plan, 28 new factories (including 21 cooperative sugar factories) and substantial expansion of 26 existing factories were completed. These have added a capacity of about 0·50 million tons of sugar. During this period three idle and unregistered factories *viz.* Bhatni (U.P.), Siwan (Bihar) and Vijayalakshmi (Andhra Pradesh) got themselves registered under the Industries Act. The Plant at Hamira (Punjab) was purchased by a cooperative factory licensed in Gujarat and was, therefore, dismantled for installation at the new site. The small plant of 75 tons per day cane crushing capacity at Etikoppaka (Andhra Pradesh) was also sold for the establishment of a new cooperative factory at Payakoraopetta, Distt. Visakhapatnam in the same state. These licences were, therefore, revoked. Thus, there were 176 sugar factories registered under the Industries Act at the end of 1959-60, of which 168 actually worked during that season.

In connection with the formulation of the Third Five Year Plan the capacity of the sugar industry was reassessed in 1959. The installed capacity had in the past been calculated on the basis of an average working season of 120 days and sugar recovery of 10%. The actual number of working days and the percentage recovery of sugar vary considerably from region to region as also during different seasons in the same region. For assessment of capacity it was felt that the average of the past two seasons *i.e.* 1957-58 and 1958-59, would provide a fair basis and that sugar factories in the different States should be grouped into three broad regions in accordance with similarity of climate and other considerations as follows:

(a) Northeren region comprising Uttar Pradesh, Bihar, Punjab, Madhya Pradesh, Rajasthan, West Bengal, Assam and Orissa;

(b) Western Region comprising Maharashtra and Gujarat; and

(c) Southern Region comprising Andhra Pradesh, Madras, Mysore, and Kerala.

The average number of working days and the percentage recovery of sugar for the different regions have worked out as unedr:

	Number of working days	Percentage recovery of sugar
Northern region	115	9·7
Western region	130	11·3
Southern region	130	9·5

On this basis the registered capacity of the sugar industry in 1959-60 was reassessed at about 2·14 million tons of sugar per annum. Further capacity of about 0·11 million tons is expected to go into production during 1960-61, the last year of the Plan, thus raising the total to 2·25 million tons at the end of the Second Plan. The State-wise distribution of the installed capacity in 1959-60 and that expected in 1960-61 is given below:

	1959-60		1960-61	
	Number of factories	Annual capacity (million tons of sugar)	Number of factories	Annual capacity (million tons of sugar)
Uttar Pradesh	70	0·890	71	0·925
Bihar	29	0·325	29	0·327
Maharashtra	26	0·392	27	0·406
Andhra Pradesh	13	0·158	13	0·158
Mysore	8	0·082	9	0·097
Madras	7	0·084	9	0·106
Punjab	6	0·093	6	0·094
Madhya Pradesh	6	0·036	6	0·036
Gujarat	3	0·032	3	0·032
Rajasthan	3	0·017	3	0·022
West Bengal	2	0·016	2	0·016
Assam	1	0·009	1	0·009
Kerala	1	0·006	1	0·006
Orissa	1	0·003	1	0·003
Pondicherry	..	..	1	0·015
TOTAL	176*	2·143	182*	2·252

*These include 8 registered factories covering a capacity of 0.044 million tons of sugar per annum, which did not work during the season.

It will not be possible to attain the capacity target of 2·50 million tons envisaged in the Second Plan mainly due to the acute shortage of foreign exchange which made it necessary to curtail imports of sugar mill machinery and to keep the expansion of the industry in step with the growth of the manufacture of sugar mill machinery in the country. In spite of this, it has been possible to achieve and even substantially exceed the target of production. This is because in recent years, with more plentiful supplies of sugarcane and the coming into production of new factories in the peninsula of India, it has been found that, contrary to experience some 5 years ago, production can normally equal or even exceed the installed capacity.

The production of sugar from 1955-56 onwards has been as follows:

Sugar Season (November to October)	million tons
1955-56	1·86
1956-57	2·03
1957-58	1·98
1958-59	1·92
1959-60	2·42
1960-61	2·97

The State-wise production of sugar during the Second Plan is given below:

(million tons)

	1956-57	1957-58	1958-59	1959-60
Uttar Pradesh	1·080	0·942	0·888	1·221
Bihar	0·312	0·275	0·311	0·325
Maharashtra	0·240	0·320	0·321	0·392
Gujarat				0·009
Andhra Pradesh	0·142	0·152	0·120	0·137
Mysore	0·042	0·073	0·085	0·086
Madras	0·065	0·068	0·074	0·085
Punjab	0·058	0·082	0·069	0·101
Madhya Pradesh	0·049	0·034	0·021	0·028
Rajasthan	0·018	0·014	0·007	0·012
West Bengal	0·008	0·006	0·007	0·009
Assam	..	..	0·002	0·004
Kerala	0·012	0·008	0·011	0·010
Orissa	0·003	0·004	0·003	0·003
TOTAL	2·029	1·978	1·919	2·422

The fall in production during 1957-58 and 1958-59 was due mainly to the diversion of sugarcane to the production of khandsari sugar which resulted from the exemption of khandsari from excise duty up till the end of February, 1959. As against 150 days in 1956-57, the average crushing

season came down to 129 days in 1957-58 and 118 days in 1958-59. To prevent a repetition of such large scale diversion of sugarcane to khandsari during 1959-60 season, Government took the following steps:

(1) An excise duty of Rs. 4·63 per maund was imposed on all khandsari sugar from 1st March, 1959. This was reduced to Rs. 4·17 per maund with effect from 21st April, 1959 on khandsari produced by sulphitation plants and Rs. 3·24 per maund on khandsari produced by other units using power driven centrifugals.

(2) In U.P. and Punjab, where the khandsari problem was most acute, the State Governments promulgated orders which made the licensing of khandsari units compulsory.

In addition to these measures, Government announced the following incentives for maximising the production of sugar during 1959-60:

(a) An increase of 3 annas per maund in the price of sugarcane supplied to sugar factories;

(b) A rebate of 50% in the basic excise duty on sugar produced by factories during 1959-60 in excess of their average production in the previous two seasons.

As a result of these measures, there was record production of sugar in 1959-60 amounting to 2·42 million tons which is well above the target of 2·25 million tons fixed for the Second Plan. The production for 1960-61 exceeded the record of the preceding year and went upto 2.97 million tons.

Consumption.—The estimated internal consumption of sugar from 1955-56 onwards has been as follows:

Sugar Season	million tons.
1955-56	1·94
1956-57	1·99
1957-58	2·04
1958-59	2·08
1959-60	2·02
1960-61	2·05 (provisional)

As compared to 0·43 million tons for 1957-58, the 1958-59 season opened with lower stocks of sugar at 0·33 million tons. Added to this, there was lower output of sugar in 1958-59. The prices of sugar, therefore, showed an upward trend in the summer of 1959. In order to protect the interests of the consumer, Government had to control all releases of sugar from factories situated in U.P., North Bihar and Punjab and also its ex-factory price. Control was later extended to South Bihar factories.

Imports and exports.—There have been no imports of sugar during the Second Plan period.

Taking advantage of the high prices of sugar prevailing in international markets during 1957 as a result of the Suez blockade and the failure of the beet crop in Europe, India exported about 154,000 tons of sugar valued at about Rs. 12 crores. By the end of 1957 world prices had fallen back and further exports were possible only at a loss. With a view fo earning foreign exchange, Government decided to export sugar at a loss and the Sugar Export Promotion Act, 1958 was passed for the purpose. According to the provisions of this Act, export quotas are announced from time to time and these are allocated to the sugar factories in proportion to their production. If any factory fails to deliver its quota for export, it has to pay an additional excise duty of Rs. 17 per maund on the undelivered quantity.

About 50,000 tons were exported from the 1957-58 production. Due to low production in 1958-59, only about 9,000 tons could be exported from that year's production. As the supply position of sugar again became comfortable, Government announced two export quotas of 50,000 tons each in September, 1960 and January, 1961. Another export quota of two lakh tons was announced in June, 1961.

Investment.—It is estimated that about Rs. 60 crores will have been invested in the sugar industry on new units and substantial expansions during the Second Plan period. A further Rs. 10 crores is estimated to have been expended on replacement and modernization of old machinery.

Cooperative sugar factories.—During the Second Plan a considerable effort was made to develop cooperative processing of sugarcane. As against 3 cooperative sugar factories existing at the end of the First Plan, the number went up to 30 at the end of the Second Plan. Their State-wise distribution is as follows:

State	Nos.
Maharashtra	14
Mysore	3
Madras	3
Punjab	3
Gujarat	2
Andhra Pradesh	2
Uttar Pradesh	2
Assam	1
TOTAL	30

The cooperative factories accounted for about 12% of the total production of sugar in 1959-60 and their share is expected to rise to about 15% in 1960-61. During the Second Plan period, the State Governments contributed about Rs. 4·5 crores towards the share capital of cooperative sugar factories. During this period the Industrial Finance Corporation sanctioned loans to cooperative sugar factories amounting to about Rs. 15·2 crores.

Manufacture of sugar mill machinery.—When the foreign exchange position deteriorated during 1957, there were 12 new factories, almost all cooperatives, which had been licensed under the Industries Act but were without import licences for sugar machinery. Half a dozen schemes had also been licensed for the manufacture of complete sugar plants in collaboration with foreign firms of repute. Through the efforts of the Ministry of Commerce and Industry, two consortia consisting of three manufacturers each, were formed in 1958. By pooling resources and coordinating production the consortia were able to accept orders for the fabrication of four sugar plants each of a daily crushing capacity of 1,000 tons of sugarcane for delivery during 1960-61 and 8 such plants during 1961-62. Foreign exchange was released to the extent of about Rs. 180 lakhs for equipping the workshops of the consortia and Rs. 25 lakhs for importing components for each sugar plant. The consortia have developed capacity to fabricate from 1961-62 onwards 12 complete plants per year and equipment for replacement and expansion equivalent to 9 plants. The foreign exchange content had been reduced to about Rs. 16 lakhs per plant by 1960-61 and efforts are being made to reduce it further. The cost of machinery for a complete sugar plant of 1,000 tons of sugarcane crushing capacity per day has been fixed at Rs. 84 lakhs.

Tariff enquiry.—The Tariff Commission conducted an enquiry during 1958-59 into (a) the cost structure of the sugar industry; (b) the fair price for sugar payable to the industry; and (c) claims of the sugar industry for rehabilitation charges and profits. The Commission prepared four separate cost schedules applicable to four regions. The Commission did not recommend the grant of any rehabilitation allowance for fixation of ex-factory price, since they came to the conclusion that such an allowance was not justified for all the units in the industry. The Government have accepted the recommendations of the Commission and decided to make use of the cost schedules prepared by the Commission to fix the control prices of sugar, wherever necessary. The current ex-factory price fixed for U. P. and North Bihar is Rs. 37·85 per maund and that for the Punjab and South Bihar is Rs. 38·35 per maund.

II. Programme of Development in the Third Plan:

Estimated requirements.—The table below gives the data relating to the estimated consumption of sugar from 1955-56 onwards:

	Population (millions)	Consumption (million tons)	Per capita consumption (lbs. per annum)
1955-56	397	1·94	10·9
1956-57	405	1·99	11·0
1957-58	413	2·04	11·1
1958-59	421	2·08	11·1
1959-60	429	2·02	10·5
1960-61	438	2·05 (provisional)	10·5 (provisional)

In fixing the target for the Third Five Year Plan, the following three factors, which have been taken into account are discussed below:

(1) *Increase due to increase in population.*—According to the estimates given in the Report on the Third Five Year Plan, the population at the end of the Third Plan will be 492 millions. In 1957-58, the latest year when there was no control over sugar and it was freely available, 413 million people consumed 2·04 million tons of sugar. At this rate of consumption, the requirements of 492 million people in 1965-66 would be 2·43 million tons.

(2) *Increase due to changes in the dietetic habits of the people and* (3) *Increase due to increase in the purchasing power of the people.*—Between 1952-53 and 1957-58 there was an average increase in the total consumption of sugar of about 44,000 tons *per annum* on these two accounts. Assuming that, as a result of the higher incomes expected to be generated in the next 8 years *i.e.* 1958-59 to 1965-66, there would be an average increase of 50% in this rate of increase, the total increase on these accounts is estimated at 0·53 million tons.

Adding 0·53 million tons to 2·43 million tons, the internal requirements of sugar in 1965-66 may be estimated at 2·96 million tons or roughly 3 million tons at constant prices at current level.

Targets of capacity and production.—In the sugar industry, the stage of self-sustained growth had been reached by the end of the Second Plan period as a result of the progress made in the manufacture of mill machinery in the country. A second major factor which would influence the pace of growth of this industry is the expected availability of sugarcane. The Third Plan envisages expansion of sugarcane output to 10 million tons (in terms of gur) mainly through improvements in yield per acre. After allowing for diversion of sugarcane for jaggery manufacture and other miscellaneous uses, about 35 million tons of sugarcane are expected to be available for sugar production. To cope with the crushing of these supplies in this seasonal industry, expansion of capacity to 3·5 million tons per annum has been projected under the Third Plan.

Throughout the Plan period, the production of sugar in the country is expected to meet the internal demand in full and the surplus will be exported.

Additional capacity required.—In addition to the capacity of 2·25 million tons which is expected to be in existence at the end of the Second Plan, a capacity of about 0.88 million tons consisting of 37 new units including 26 cooperatives and 80 substantial expansions has been licensed or approved for licensing. This may be expected to go into production

during the first two years of the Third Plan. If this capacity is duly installed, the additional capacity required to be licensed against the Third Plan target would be about 0·37 million tons.

Experience of licensing during the First and Second Plan periods shows that nearly 60% of the additional capacity has gone to new units and the remaining 40% to substantial expansions. It is felt that the pattern of additional capacity still to be licensed against the Third Plan target, may be visualised nearly on the same lines *i.e.* about 40% will be absorbed by expansions and 60% by establishment of new units. This would involve the setting up of 18 new factories each with a cane crushing capacity of 1000 tons per day.

Investment.—The capital investment required to establish a new sugar factory with a daily crushing capacity of 1,000 tons is currently estimated at Rs. 1.4 crores. An equivalent capacity established by way of expansion may cost about half as much. The total investment required to establish the additional capacity of 0.37 million tons may thus be estimated at Rs. 35 crores. In addition, a major part of the investment of Rs. 75 crores required for establishing the capacity which has already been approved and is expected to start production after 1960-61 will be incurred during the Third Plan period.

The capital investment and foreign exchange requirements of the sugar industry for new units and substantial expansions during the Third Plan period on the basis of the supply of machinery by the consortia using minimum imported components have been estimated as follows:

(Rs. crores)

	Total investment	Foreign exchange requirements
For 18 new factories covering a capacity of 0·23 million tons	26·0	3·0
For substantial expansions covering a capacity of 0·14 million tons	9·0	1·0
37 new units and expansions of 80 existing units which have already been approved and are expected to go into production during the Third Plan period	65·0	8·0
TOTAL	100·0	12·0

In addition to the investment required for establishing additional capacity it is probable that appreciable amounts will be invested by existing factories on replacement and modernization of old machinery. In the Second Plan it was estimated that about Rs. 50 crores would have to be expended on this account, but mainly due to foreign exchange difficulties it was not possible to make much headway. However, factories which carried out

expansion in their capacities during the Second Plan period took advantage and replaced old machinery to the extent possible. Similarly, factories which have yet to implement their approved expansion programmes are expected to do so during the Third Plan period.

There would still remain considerable backlog of replacements which would need to be made up during the Third Plan period. The investments required for replacing old and worn out machinery installed in the sugar industry, which has completed its normal life of 20 years or so, is tentatively estimated at Rs. 25 crores.

Growth of the cooperative sector.—The cooperative movement in the sugar industry is expected to march forward with greater strides during the Third Plan period. Out of 37 new factories which have been licensed or approved for licensing and are expected to start production in the first two years of the Third Plan, 26 are cooperative ventures. The number of cooperative factories at the end of the Third Plan is expected to rise to about 65 out of a total of about 235 sugar factories in the country. A provision of Rs. 6.23 crores has been made in the Third Plan for contributions by State Governments to the share capital of cooperative sugar factories.

Employment.—The establishment of the additional capacity of about 1.25 million tons of sugar during the Third Plan period is expected to provide employment to about 50,000 persons.

Requirements of raw materials.—The sugar industry will require the following quantities of principal raw materials for achieving a production of 3·5 million tons of sugar in 1965-66:

Sugarcane	35 million tons
Lime (in terms of limestone)	350,000 tons
Coal	350,000 tons
Coke	26,000 tons
Sulphur	26,000 tons

The table below summarises the development programme for the sugar industry in the Third Five Year Plan:

	1960-61	1965-66
Capacity (million tons)	2·25	3·50
Production (million tons)	2·97	3·50

71. VEGETABLE OILS

1. Review of Progress in the Second Plan:

Major Oilseeds

The production target for the five major oilseeds had been fixed originally at 70 lakh tons and the production of the oil in 1960-61 placed at 17·74 lakh tons. The oilseed target was later on revised upwards to 75·7 lakh tons which would have the effect of raising the production of oil in the country on a *pro rata* basis.

Production.—The year-wise production of the five major oilseeds *viz.* groundnut, sesamum, linseed, rape & mustard and castor were as follows:

(lakh tons)

Oilseeds	1956-57	1957-58	1958-59	1959-60	1960-61
Groundnut	43·00	44·36	48·12	43·90	43·54
Sesamum	4·31	3·54	5·11	3·92	2·28
Linseed	3·84	2·49	4·47	4·25	4·10
Rape & Mustard	10·26	9·23	10·25	10·37	13·80
Castor	1·22	0·89	1·12	1·08	0·98
TOTAL	62·63	60·51	69·07	63·52	65.30

There was thus a considerable shortfall in production even in relation to the original target set for oilseeds. The policy adopted in the First Plan was continued during the Second Plan period and expansion of capacity of oil mills was not allowed.

The year-wise production of different vegetable oils during the Second Plan period has been estimated as follows:

(Figures in lakh tons)

Oil	1956-57	1957-58	1958-59	1959-60	1960-61
Groundnut	9·80	10·11	10·97	10·01	9·93
Sesamum	1·33	1·09	1·57	1·21	0·89
Linseed	1·14	0·74	1·32	1·26	1·22
Rape & Mustard	2·75	2·47	2·75	2·78	3·70
Castor	0·46	0·33	0·42	0·41	0.37
TOTAL	15·48	14·74	17·03	15·67	16·11

Exports.—It was estimated that after allowing for internal consumption, about 214,000 tons of vegetable oils would be available annually for export during the Second Plan. The table below reveals that the exports were far

below the target set. Apart from the lower levels of production, the reasons for this shortfall were:

(i) Indian prices for groundnut oil in West European markets were higher than West African quotations; and

(ii) competition from Argentine, U. S. A. and Canada in the case of linseed oil and Brazil in the case of castor oil.

Data relating to actual exports since 1956 are given below:

Q—Quantity in '000 tons.
V—Value in Rs. lakhs.

Oil	1956-57		1957-58		1958-59		1959-60		1960-61	
	Q	V	Q	V	Q	V	Q	V	Q	V
Castor . . .	43	682	37	669	18	272	46	559	46	671
Groundnut . .	1	12	..	..	5	75	38	525	1	21
Linseed . . .	32	544	20	223	14	199	18	253	7	87
Others . . .	22	314	15	161	8	91	7	75	7	72
TOTAL .	98	1,552	72	1,053	45	637	109	1,517	61	851

Coconut Oil

It was envisaged that as against a production of 130,000 tons of coconut oil in 1956 it would be stepped up to 210,000 tons by 1960-61 so as to meet the anticipated requirements in full from indigenous sources. The production of coconut has been approximately 4,500 millions. Out of this production, only 46 per cent was estimated to have been actually converted into copra of which again 80% only was used for the production of oil. Assuming average oil recovery from copra at 62%, the average annual availability of coconut oil has been estimated at about 148,000 tons. The target was largely unfulfilled and substantial imports of coconut oil and copra had to be made to meet the indigenous requirements. The imports were as follows:

Q—Quantity in '000 tons.
V—Value in Rs. crores

	Copra		Coconut Oil		Palm oil	
	Q	V	Q	V	Q	V
1956-57	99	9·43	21	2·90	N.A.	2·32
1957-58	124	12·06	14	2·40	19	2·52
1958-59	94	10·64	5	1·10	20	2·24
1959-60	85	10·91	4	0·43	28	3·35
1960-61	98	11·64	Nil	Nil	31	3·53

It would be seen that the import of coconut oil as such has been completely banned in 1960-61. Imports of coconut oil were replaced by the cheaper palm oil which could replace it in the soap industry.

Cottonseed Oil

Although in relation to the potential represented by the availability of cottonseed in the country, there is considerable scope for the development of cottonseed oil industry, a target of only 30,000 tons for 1960-61 was proposed for this oil production which was insignificant till 1955. There were several problems requiring solution before a really big programme of cotton seed oil production could be taken in hand, *e.g.* popularisation of consumption of oilcake as animal feed in place of wholeseed, disposal of by-products like cotton linters etc. The position of this industry was reviewed in 1958 by the *Ad hoc* Committee on Cottonseed Oil Industry set up by the Government and the target was revised upwards to 60,000 tons. Exemption from excise duty gave an impetus to the growth of this industry. Rebate of excise duty payable by vanaspati industry for the use of cottonseed oil has also been in force from 1960. The production of cottonseed oil in the organised sector since 1956 was as follows :

Figures in tons

	Capacity (in terms of seeds)	Production (in terms of oil)
1956	81,400	6,000
1957	94,600	7,157
1958	94,600	9,452
1959	94,600	9,100
1960	179,283	13,180

Cottonseed oil is also produced in the un-organised sector and the following are the estimated production figures:

	Production (tons of oil)
1956	N.A.
1957	6,000
1958	8,000
1959	8,000
1960	10,000

The cottonseed crushing industry is not sufficiently remunerative for a number of reasons *e.g.* (i) high price to be paid for cottonseed as it is being used for feeding cattle, (ii) yield of only 12-13% of oil from cottonseed

which is small compared to the other oilseeds and (iii) lack of demand of cottonseed cake. For these reasons, production of cottonseed oil did not reach the target in spite of the incentives offered.

Solvent Extraction of Oil Cakes

At the beginning of the Second Plan period the capacity for solvent extraction was 1·36 lakh tons. Since then, gradual increase in capacity and production was achieved as can be seen from the figures below :

Figures in tons

	Capacity (in terms of oil-cake)	Production (in terms of oil)
1956	136,500	5,675
1957	157,500	11,131
1958	208,500	16,575
1959	361,500	20,700
1960	556,260	27,150

Viewed against a target capacity of 8 lakh tons of oil-cake and production of 64,000 tons of oil, there has been a considerable shortfall.

II. Programme of Development in the Third Plan :

(a) *Major oilseeds.*—During the Third Plan period it is proposed to increase the production of the five major oilseeds to 9·8 million tons by 1965-66. The estimated production of the major oilseeds by 1965-66 and the quantity of oil that could be extracted from them are given below. Estimates have been made on the assumption that the pattern of oil extraction by mills and *ghanis* would continue as in the Second Plan and allowing for similar proportions for direct consumption and miscellaneous uses of oil-seeds :

Figures in lakh tons

Oil	Quantity of oil-seeds	Quantity of oil available on extraction
Groundnut	67·0	15·28
Sesamum	8·2	2·53
Rape & Mustard	14·8	3·97
Linseed	4·6	1·37
Castor	3·4	1·28
TOTAL .	98·0	24·43

(b) *Coconut oil.*—From an average annual production of about 4,500 million nuts during the Second Plan, it is proposed to increase the output to 5,275 million nuts by the end of the Third Plan. Assuming a similar pattern of utilisation of nuts and copra as in the Second Plan, the quantity of coconut oil that would be available is about 175,000 tons. Apparently this would be insufficient to meet the internal needs in full and import of copra or substitutes for coconut oil like palm oil on a substantial scale may have to be continued during the Third Plan period.

(c) *Cottonseed oil.*—In addition to the existing 13 cotton seed oil mills with an aggregate capacity of 200,460 tons for processing the seed, seventeen more units have been licensed/approved for licensing, bringing the aggregate capacity of existing and licensed units to 4·98 lakh tons per year. The state-wise distribution of capacity of cottonseed oil plants in the organised sector is as follows:

State	Capacity in terms of tons of cottonseed per year	
	Existing capacity as on Oct. 1961	Additional capacity licensed
Andhra Pradesh	12,860	15,000
Madras	15,000	Nil
Mysore	54,000	44,000
Madhya Pradesh	30,000	36,000
Gujarat and Maharashtra	88,600	165,300
Delhi	Nil	16,680
Punjab	Nil	9,000
Uttar Pradesh	Nil	12,000
TOTAL	200,460	297,980

Taking into account the potential for cottonseed oil extraction as well as the practical difficulties, a target production of 1 lakh tons of cottonseed oil per annum has been envisaged for 1965-66.

(d) *Solvent extraction of oil cakes.*—The existing capacity (as on Oct. 1961) of the 36 units in operation amounts to about 7·29 lakh tons in terms of throughout of oil cake. In addition, 100 units have been licensed bringing the total of the existing and licensed capacity to 24·62 lakh tons of oil cake per annum. A target of 160,000 tons of solvent extracted oil is envisaged by 1965-66.

The policy in respect of licensing new units or expansion in the capacity of the existing units has been based on the consideration that the scheme proposed would have to meet a substantial part of the requirements of oil-cake from internal supplies. In the matter of allowing import of solvent

extraction plants the current policy is to permit a third of the total value of the machinery to be imported subject to the balance being fabricated within the country.

(e) *Rice bran oil.*—An important source of vegetable oil to which thought has recently been given is rice bran. During the process of rice milling, the layer round the endosperm together with a portion of polishing is removed. This bran constitutes roughly between 5 and 8% of the unpolished rice. Rice bran produced in existing rice mills in the country has mostly been used as cattle feed. It contains about 15-20% edible oil which is comparable in many respects to seasamum oil.

The difficulty in extration of oil from rice bran arises from the fact that it hydrolyses due to the presence of an enzyme called lipase and free fatty acids are formed. The lipase can be inactivated by heat treatment and stabilised rice bran can be kept for 8 to 10 weeks.

The total quantity of rice-bran available in the country is estimated to be about 1·5 million tons. However, in view of the technical difficulties involved in processing this material, production of this oil cannot be expected beyond a modest level in the Third Plan period. It is felt realistic to target for a production of about 50,000 tons of this oil by 1965-66. Exemption of excise duty on rice bran oil has been given as an incentive to promote the growth of this industry. The various aspects connected with the development of this industry are under the consideration of an *Ad-hoc* Committee.

Internal requirements.—The total quantity of vegetable oils available from major sources (excluding oils available from minor oil seeds like neem, mahua, karanj etc.) is likely to be as follows in 1965-66:

Source	Quantity (in lakh tons)
Major oil seeds	24·43
Coconut	1·75
Cotton seed	1·00
Solvent extraction of oil cakes	1·60
Rice Bran	0·50
TOTAL	29·28

Internal demand for edible purposes is estimated to be as follows:

	1965-66 (lakh tons)
Consumption as liquid oil	16·55
Consumption of Vanaspati	5·35
TOTAL	21·90

In addition, the requirement of vegetable oils for industrial purposes in 1965-66 is envisaged as follows:

	(lakh tons)
Soap Industry	2·98
Paints & Varnishes	0·62
Toilet purposes	2·56
Miscellaneous including lubrication	0·45
TOTAL	6·61

Thus total internal requirements would aggregate to about 28·5 lakh tons against production anticipated at 29·3 lakh tons.

Exports.—From the figures of supply and internal demand which have been brought out in the preceding paragraphs, it would appear that about 90,000 tons of vegetable oils may be available for export in 1965-66, if programmes for development materialise as envisaged. Castor oil may still form the main single item of export followed by linseed oil.

Investment.—The total investment during the Third Plan period in the cottonseed oil, solvent extraction of oil-cakes and rice bran oil industries is expected to be of the order of Rs. 9 crores of which about Rs. 2·2 crores is estimated to be the foreign exchange requirements.

The development programme for the vegetable oil industry in the Third Plan is summarised in the following table :—

	1960-61	1965-66
Capacity		
Cottonseed oi ('000 tons of seed)	179.3	850
Solvent extraction ('000 tons oil cakes)	556.3	2,000
Production		
Cottonseed oil ('000 tons)	23*	100
Solvent Extraction ('000 tons of oil)	27	160

*Includes production of unorganised sectbr.

72. VANASPATI

I. Review of progress in the Second Plan:

Targets.—It was envisaged under the Second Plan that the total production of vanaspati would be 400,000 tons in 1960-61, out of which about 20,000 tons would be exported. The existing capacity of the industry *i.e.*, 445,000 tons per annum was considered sufficient to meet the demand for vanaspati during the Second Plan period.

Capacity.—The position in regard to the installed capacity of the vanaspati industry, as it stood at the beginning and close of the Second Plan period, is summarised below:

Category	On 1-4-56		On 1-4-61		
	No. of factories	Capacity ('000 tons)	No. of factories	Capacity on old basis (0) ('000 tons)	Capacity as re-assessed (R) ('000 tons)
Registered/Licensed under Industries Act.—					
Working . . .	43	367·1	42	414·7	470·3
Closed . . .	8	45·0	7	48·0	45·9
Not registered/licensed under Industries Act.—					
Closed . . .	7	33·0	6	29·0	31·2
TOTAL .	58	445·1	55	491·7	547·4

As the installed capacity, even of the working factories alone, remained appreciably in excess of the demand for the product during the entire period, the earlier policy of not permitting expansion of the overall capacity, whether by import of plant or by fabrication within the country, continued in force during the Second Plan period. At the same time, with a view to gainfully utilising idle capacity already available in the country, expansion of existing factories was permitted, if it could be done by utilisation of such capacity alone; similarly, the re-starting of idle factories, either at their original sites or at fresh locations, was also permitted.

In terms of the above policy, licenses for substantial expansion were issued during the period to the following 8 existing factories for a total additional capacity of 48,300 tons per annum, all these expansions were achieved by utilisation of vanaspati plants, or portions thereof, lying idle.

Name of factory	Capacity per annum (R)	
	From ('000 tons)	To ('000 tons)
M/s. Western India Veg. Prods. Ltd., Amalner (Maharashtra) .	7·20	10·50
M/s Hindustan Dev. Corp. Ltd., Calcutta (West Bengal) . .	7·50	15·00
M/s. Ahmed Oomerbhoy, Bombay (Maharashtra) . . .	3·00	7·50
M/s. Vegetable Prods. Ltd., Belghuria (West Bengal) . . .	8·55	16·50
M/s. Amrit Banaspati Co. Ltd., Ghaizabad (U.P.) . . .	15·00	22·50
M/s. Ganesh Flour Mills Co. Ltd., Kanpur(U.P.) . . .	15·00	22·50
M/s. Hindustan Lever Ltd., Ghaziabad (U.P.)	9·45	16·50
M/s. East Asiatic Co. Ltd., Madras (Madras)	3·00	6·00
TOTAL .	68·70	117·00

The following 5 factories which were either under construction, or were lying closed at the commencement of the Second Plan, went into production during the period:

Name of factory	Capacity per annum (R) ('000 tons)
M/s. Aryan Industries, Secunderabad (A.P.)	4·50
Govt. Hydrogenation Factory, Calicut (Kerala)	3·00
M/s. Madhusudan Vegetable Prods., Rakhial (Gujarat)	3·00
M/s. Palanpur Vegetable Products (Gujarat)	3·00
M/s. Ravi Veg. Oils Industries, Davangere (Mysore)	7·50
TOTAL	21·00

The following 3 factories suspended production of vanaspati during the Second Plan period and continued to remain closed during the rest of the period:

Name of factory	Capacity per annum (R) ('000 tons)
M/s. Swastik Oil Mills Co. Ltd., Bombay	7·50
M/s. Berar Swadeshi Vanaspati, Shegaon	7.20
M/s. Amrut Oil Mills, Bombay	7·20
TOTAL	21.90

The Statewise distribution of vanaspati factories, both working and closed, as on 1st April 1961 is given below:

	Registered/licensed under Industries Act				Not registered/ licensed under Industries Act Closed	
	Working		Closed			
	No.	Capacity ('000 tons)	No.	Capacity ('000 tons)	No.	Capacity ('000 tons)
Andhra Pradesh	2	19·80	1	6·00	1	7·50
Bihar	1	13·50	..	..	..	..
Delhi	2	42·00	..	..	..	..
Gujarat	5	33·15	1	7·50	1	7·50
Kerala	2	5·40	..	..	..	..
Madhya Pradesh	1	11·25	..	..	1	3·00
Madras	4	16·95	1	6·00	..	..
Maharashtra	9	132·00	2	14·70	1	7·20
Mysore	4	14·40	..	..	1	3·00
Punjab	2	12·90	..	..	1	3·00
Uttar Pradesh	4	87·00	1	4·50	..	..
West Bengal	6	81·90	1	7·20	..	..
TOTAL	42	470·25	7	45·90	6	31·30

Production, consumption and exports.—Figures relating to production, indigenous consumption and exports of vanaspati during the Second Plan period are given below:

(in '000 tons)

	No. of factories worked	Production	Indigenous consumption	Exports	Stock carried over
1956-57	41	263·8	252·9	11·1	7·2
1957-58	40	300·1	296·0	2·8	8·5
1958-59	40	299·1	296·5	2·6	8·5
1959-60	41	329·6	324·3	3·0	10·8
1960-61	43	334·9	329·7	6·7	9·3

In addition to Vanaspati, about 20,000 tons per year of Industrial Hard Oil (used in the manufacture of soaps and fatty acids and in the sizing of textiles) and 30,000 tons of Refined Oil are also being manufactured each year by vanaspati factories.

The pace of exports achieved during the period has considerably fallen short of the target of 20,000 tons per year. This was mainly due to the high price of groundnut oil, its main raw material, prevailing during the better half of the period, as a result of which Indian vanaspati was priced out of foreign markets, and exports could not be effected except at considerable loss. In order to offset this loss at least partially, if not fully, and thereby stimulate exports to the extent possible, an incentive scheme providing for the grant of import licences for copra to exporters of Vanaspati for a specified value, was introduced in October 1959 and is still in force. As a result of the incentive scheme there was a substantial increase in exports in 1960-61.

Consumption of raw oils.—Consumption of different vegetable oils in the manufacture of vanaspati during the Second Plan period was as under:

('000 tons)

	Groundnut oil	Cotton-seed oil	Sesamum oil	Other oils	Total
1956-57	280·6	1·8	15·1	2·2	299·7
1957-58	293·6	5·9	16·9	3.3	319·7
1958-59	280·8	11·9	16·7	0·1	309·5
1959-60	310·0	12·9	19·5	0·1	342·5
1960-61	305·8	20·3	18·6	0·2	344·9

With a view to reducing the pressure on groundnut oil and also to increase the overall supply position of edible oils in the country, vigorous efforts were made during the period, on the one hand to promote increased production of good-quality cotton-seed oil in the country, and on the other

to encourage the increased use of this oil in the manufacture of vanaspati. The recommendations made by an *Ad hoc* Committee set up in this connection by the Government in 1958 are in the process of being implemented. As a result of these efforts, the quantity of cottonseed oil used in the manufacture of vanaspati increased from just 360 tons in 1955-56 to 12,900 tons in 1959-60, the corresponding levels of incorporation being 0·1% and 3·8% respectively. In order to promote the use of cottonseed oil at still higher levels, an incentive scheme was introduced in July 1960, which provided for the grant of a graded rebate of excise duty payable on vanaspati, depending upon the level of incorporation of cottonseed oil therein. During 1960-61, 20,300 tons of cottonseed oil was used in the manufacture of Vanaspati, the level of incorporation being 5·9%.

II. Programme of Development in the Third Plan:

Demand for the product and installed capacity of industry.—Keeping in view the growth of population, rise in per capita income, income elasticity of demand and export requirements, it has been estimated that the demand for vanaspati in 1965-66 would be about 475,000 tons. Production of ghee may be expected to increase, if at all, only to a limited extent, and the rising demand for cooking fat would almost entirely have to be met by vanaspati.

In view of the current restrictions on the import of mutton tallow, the demand for industrial hard oil is also expected to increase to around 25-30,000 tons per year by 1965-66.

For producing 475,000 tons of Vanaspati and about 25,000 tons of industrial hard oil, or a total of 500,000 tons of hydrogenated vegetable oils per annum, the installed capacity of the industry will have to be around 550,000 tons per annum. Although, as indicated earlier, the overall capacity of the industry is already around 550,000 tons per annum, only some 470,000 tons pertaining to 42 factories was functioning as on 1-4-61, the remaining (about) 80,000 tons pertaining to 15 factories lying idle. It is however, expected that this idle capacity will be gradually put into effective use according to the growth in demand.

Exports.—Based on performance during the recent past, it would be unrealistic to reckon upon any large-scale exports of hydrogenated vegetable oil. It is, therefore, envisaged that the level of exports during the Third Plan period may not be higher than 10,000 tons per year, valued at about Rs. 2 crores.

Raw material requirements.—Raw vegetable oils constitute the main raw material for the manufacture of vanaspati and other hydrogenated products. To achieve a production of 500,000 tons of vanaspati and industrial hard oil in 1965-66, the industry will require 535,000 tons of raw vegetable oils, the bulk of which, as in the past, would be groundnut oil. On account of its comparatively higher cost, the use of sesamum oil in vanaspati is, as a rule, limited to the statutory minimum of 5% required to be added for facilitating detection of vanaspati when used as an adulterant in ghee, by means

of the Baudouin Test. Reference has already been made earlier in this Chapter to the efforts made for promoting increased use of cottonseed oil in the manufacture of vanaspati with a view to reduce the pressure on groundnut oil and also to enable its export in larger quantity. It is anticipated that by the end of the Third Plan period, cottonseed oil will constitute at least around 15% of the total quantity of raw oils used by the vanaspati industry.

With the same end in view, and also bearing in mind the marginal adequacy of the present supply position of edible oils in the country *vis-a-vis* the demand therefor, the possibility of importing soyabean oil from the U.S.A. under PL 480 has also been examined. In this connection, an experimental quantity of 3,000 metric tons of this oil, contracted for in September 1960, has just been received and is in the process of being tried out by the factories in the manufacture of vanaspati. Once the factories are acquainted with the technique of handling this somewhat difficult oil, the feasibility of importing the oil on a larger scale could be considered, if and when the need therefor is felt at a later date, in the context of the supply position then prevailing.

Provided that such large-scale import of soyabean oil is not found necessary at any time during the Third Plan period, the pattern of raw oil consumption by the vanaspati industry by 1965-66 would be as under:

Name of oil	Quantity ('000 tons)
Groundnut oil	430
Sesamum oil	25
Cotton seed oil	80
TOTAL	535

The requirements of other major raw materials needed by the vanaspati industry by 1965-66 are shown below:

Raw material	Quantity (tons)	Value (Rs. lakhs)
Tinplate	37,750	453·0
Synthetic Vitamin A	100 lakhs M.I.U.	60·0
Nickel catalyst	500	40·0
Caustic soda	2,500	21·0
Bleaching earth	1,860	12·0
Activated carbon	500	6·0
Filter-aid	375	4·5

Of the above items, the requirements of tinplate and caustic soda have so far been met partly from indigenous manufacture and partly from imported stocks but it is expected that towards the end of the Third Plan the supply would be entirely indigenous. Synthetic Vitamin A had to be imported until a couple of years back, but is now being manufactured indigenously in sufficient quantity to meet the entire requirements of the vanaspati industry. So far as bleaching earth and activated carbon are concerned, these chemicals too had, until a few years back, to be imported in full, but they are now being manufactured indigenously to an increasingly larger extent, and further import thereof may not be necessary except to the extent required for processing deep-coloured oils like cottonseed oil, for which the quality of indigenous earth and carbon is reported to be not quite satisfactory. Filter-aid and nickel catalyst are not yet being manufactured indigenously and hence their requirements have still to be imported in full.

The following table summarises the programme of development for the vanaspati industry during the Third Plan:

	('000 tons)	
	1960-61	1965-66
Installed capacity (of working factories)	470·3	550.0
Production		
Vanaspati	334·9	475·0
Industrial hard oil	15·7	25·0
Indigenous consumption		
Vanaspati	329·7	465·0
Industrial hard oil	15·7	25·0
Exports	6·7	10·0

73. MILK PRODUCTS

India consumes a variety of dried, condensed and malted milk products which, due to lack of indigenous production, were until recently almost entirely imported. The imports of dried and partially dried milk products in 1956-57 when these were freely allowed amounted to about Rs. 9·4 crores.

The demand for dried and evaporated milk products varies in different parts of the country and is in fact an index of the supply of fresh milk from local sources. There is undoubtedly a strong preference for fresh milk. But where that is not available in sufficient quantity or its quality is considered doubtful as is the case in most towns, particularly those lying in the Eastern and Southern States, manufactured products have, per force, to be used. There is also a more or less permanent demand from the Defence Forces stationed in forward positions.

There are areas in India where milk is abundantly available but owing to transport difficulties and the inaccessibility of such 'milk pockets', the milk cannot be transported in fluid condition to the consuming centres. If such milk could be converted into products like milk powder or condensed milk on the spot by establishing factories for the purpose, it will not only provide a more lucrative market to the cattle owners for their milk but the supply of such products would help in supplementing the fluid milk supply in urban areas.

I. Brief Survey of the Industry

With the outbreak of the Second World War, the import of milk products ceased and the already serious problem of large consuming centres like Bombay and Calcutta, mainly dependent on such imports, was substantially accentuated. An enterprising company namely, M/s. National Nutrionents Ltd., took up the manufacture of proprietory milk food for infants called 'Vita Milk'. They imported three roller drying plants and installed them at Dum Dum near Calcutta, Varanasi and a place now in East Pakistan. These plants had to be closed down as they could not compete with the imported products which became once more available on the cessation of hostilities.

The Military Dairy Farms Department took up the manufacture of evaporated milk in 1945. Two plants set up for the purpose at Lahore and Okara (Montgomery) both went to Pakistan as a result of the Partition.

The *Khadi Pratisthan*, a charitable organisation, started the manufacture of sweetened condensed milk in West Bengal. Even though on a cottage scale, it did quite well while the war lasted but it met the fate of National Nutrionents Ltd., as it could not face competition with the imported product.

With financial assistance from the UNICEF and the Government of New Zealand, the Kaira District Cooperative Milk Producers' Union Ltd., Anand (Gujarat) established a spray drying plant in 1955. This gave the country the first modern plant for the manufacture of spray-dried milk.

The development of the milk powder industry received special attention under the dairy development programme included in the Second Five Year Plan which provided for the establishment of seven milk powder factories in the public sector at a cost of Rs. 1·4 crores. However, due to foreign exchange difficulties, this programme had to be curtailed and confined to those schemes for which equipment was available under foreign aid programmes. The balance of payments difficulty, due to which imports of milk products had to be drastically curtailed, encouraged a number of foreign manufacturers to consider establishing plants for the manufacture of their products in India.

Capacity and production.—At the commencement of the Third Five Year Plan, there was only one dairy factory located at Anand (Gujarat) with an annual capacity of 1,200 tons of milk powder and 3,000 tons of condensed milk. Besides this large plant, there were a number of small-scale units producing condensed milk by the open pan method.

There were two units *viz.*, Kaira Cooperative Milk Producers' Union Ltd., Anand (Gujarat) and M/s. Glaxo Laboratories (India) Private Ltd., Aligarh (U.P.) which were manufacturing milk foods for infants. Their annual capacity was 2,500 tons each.

There were four units manufacturing malted milk foods. Their total capacity was 2,316 tons. They are:

	Annual capacity (tons)
M/s. Cadbury-Fry (India) Private Ltd., Bombay	804
M/s. Hindusthan Milk Food Manufacturers Ltd., Nabha (Punjab)	900
M/s. Alvitone Laboratories, Madras	300
M/s. Vitalone Research Laboratories, Madras	312
TOTAL	2,316

The production of various milk products from 1956 onwards has been as follows:

(tons)

	Milk powder	Condensed milk	Malted milk foods
1956	177	..	60
1957	495	..	226
1958	937	79	424
1959	569	224	562
1960	588	27	1,112

Comercial production of infant milk food was started only in January 1961. The production of condensed milk in 1960 was low due to some technical difficulties experienced by the only unit *viz.*, Kaira Cooperative Milk Producers' Union.

Capital and labour.—The fixed capital invested in the milk products industry up to the end of the Second Plan period is roughly estimated at Rs. 1 crore. The foreign exchange element of this investment is estimated at Rs. 55 lakhs.

The number of persons employed by the industry is estimated at 1,000.

Raw materials.—The principal raw material required by the industry is fluid milk. The other raw materials required for malted milk foods are cocoa powder, malt extract and sugar. All these materials are available from indigenous sources.

Imports.—The imports of various milk products for the last four years have been as follows:

(Rs. in lakhs)

	1957	1958	1959	1960
Dried milk	651·1	536·3	695·1	260·1
Evaporated/condensed milk and cream	148·0	49·3	50·3	24·0
Milk foods for infants and invalids	128·4	70·4	109·1	91·2
Malted milk including powder	95·5	12·3	2·7	3·4

Due to the balance of payments difficulties, which started in 1957, the imports of milk products had to be curtailed rather heavily, so much so that even the quota for baby foods had to be reduced to about a quarter of the normal imports.

Consumption.—The present annual requirements of various milk products are estimated as under :

	(tons)
Milk powder	22,000
Condensed milk	4,000
Milk foods for infants	3,000
Malted milk foods	2,000

Problems of the industry.—In India, by and large, milk production is small and scattered. This is both because of the small unit of production which generally does not exceed one or two milch cattle and poor milk yield per animal. The average production per village and per sq. mile for the whole country does not exceed 2·38 and 1·08 maunds respectively. Because of the poor means of communication in most rural areas, collection of milk is not an easy task, particularly during the rainy season.

Moreover, care necessary to produce clean milk is seldom exercised under average Indian conditions. Clean water, so necessary for producing milk free from contamination, is not available in many villages. Consequently milk generally gets heavily contaminated due to which it has a low keeping quality. High temperature experienced over large parts of the country further accentuates the problem by providing favourable conditions for the growth of bacteria which find their way into milk.

II. Programme of Development in the Third Plan:

Estimated requirements.—With the increase in population and improvement in living standards, the demand for milk and milk products is bound to expand. The demand for dried and evaporated milk products would, by and large, depend upon the availability of fresh milk of good quality. To the extent good fresh milk is available, the demand for manufactured products would diminish and *vice versa.*

Some of the State-run urban milk supply schemes require dried skim milk for the production of 'toned' milk. The requirements of these schemes are likely to increase. Large quantities of milk powder would also be needed for use in ice cream, baking and other food industries.

The annual requirements of various milk products are expected to rise to the following levels by 1965-66:

	(tons)
Milk powder	30,000
Condensed milk	6,000
Infant milk foods	6,000

The demand for malted milk foods is flexible and hence no reliable estimates can be made.

Targets of capacity and production.—The above estimates of requirements in 1965-66 have been adopted as the production targets for various milk products for the Third Plan. Because of the uncertainty of adequate availability of milk all through the year, the capacity targets are visualised at 25% higher than the production targets. Thus, the capacity targets for various milk products are:

	(tons)
Milk powder	37,500
Condensed milk	7,500
Infant milk foods	7,500

Additional capacity required.—In addition to the existing capacity for various milk products given earlier, the following schemes have been licensed and are at various stages of implementation:

	Annual capacity (tons)
Milk powder	
M/s Food Specialities (Private) Ltd., Moga (Punjab)	450
M/s Hindustan Lever Ltd., Etah (U.P.)	2,580
M/s Hindustan Milk Food Manufacturers Ltd., Nabha (Punjab)	228
TOTAL	3,258

	Annual capacity (tons)
Condensed/Evaporated milk	
M/s Food Specialities (Private) Ltd., Moga (Punjab)	4,000
M/s Arun (Importers) Private Ltd., Muzaffarnagar (U.P.)	1,080
M/s C. & E. Morton (India) Ltd., Marhowrah (Bihar)	240
TOTAL	5,320
Infant milk foods	
M/s Food Specialities (Private) Ltd., Moga (Punjab)	670
M/s Hindustan Milk Food Manufacturers Ltd., Nabha (Punjab)	228
TOTAL	898
Malted milk foods	
M/s Wander Ltd., Ghaziabad (U.P.)	670

In addition, 2 plants for manufacture of milk powder are being set up in the public sector at Amritsar (Punjab) and Rajkot (Gujarat). Their annual capacity is 1,500 tons and 800 tons respectively. These plants are being established with assistance from the Technical Cooperation Mission of the American Government and UNICEF respectively.

On the implementation of the above schemes, the production capacities for various milk products would be raised to the following levels:

	(tons)
Milk powder	6,758
Condensed/evaporated milk	8,320
Infant milk foods	5,898
Malted milk foods	2,986

From the above assessment, it would appear that there is room for additional capacity in the case of milk powder and infant milk foods. Some more capacity may have to be created for malted milk foods also.

In the Third Five Year Plan provision has also been made for four milk products factories in the public sector at an estimated cost of Rs. 1·2 crores. These factories are expected to produce at least 6,000 tons of spray-dried skim milk annually.

Investment and employment.—It is estimated that an investment of about Rs. 3·0 crores will be made in the milk products industry during the Third Plan period. This includes the investment in the public sector projects. The foreign exchange requirements are estimated at Rs. one crore.

The milk products industry is expected to provide employment to about 3,000 persons at the end of the Third Plan period.

The following table summarises the development programme for the milk products industry in the Third Five Year Plan:

	1960-61		1965-66	
	Capacity	Production*	Capacity	Production
Milk powder (tons)	1,200	588	37,500	30,000
Condensed/evaporated milk (tons)	3,000	27	7,500	6,000
Milk foods for infants (tons)	5,000	**	7,500	6,000

*Production figures relate to the calendar year 1960.

**Production started in January, 1961.

Problems of the industry.—One of the major problems of the industry is the high price of indigenous sugar. With a view to boosting up exports of biscuits, the question of supply of sugar at competitive price to the biscuit industry was considered by the Development Council for Food Processing Industries and it has been decided in principle to make available sugar to exporters of biscuits at international price. Another problem which the industry was hitherto facing was the non-availability of suitable quality wheat flour for the manufacture of biscuits. This question was also considered by the Development Council. According to the revised arrangement the flour mills are now being given soft white wheat and hard red wheat to be blended in proper proportions so as to meet the requirements of the biscuit industry.

Major developments in the industry.—During the Second Plan period a Development Council for Food Processing Industries was set up. This Development Council deals along with other allied industries with the development and regulation of the biscuits and confectionery industry also.

In order to assist the biscuit and confectionery industry to make up the difference between the internal and international prices of sugar used in the manufacture of biscuits and confectionery, it has been agreed in principle to make available sugar to exporters of biscuits and confectionery at international price.

II. Programme of development in the Third Plan:

Estimated requirements.—The present demand for biscuits manufactured in the organised sector is of the order of 24,000 tons. It is estimated that the demand for biscuits may go upto 40,000 tons per annum by 1965-66, out of which about 1,000 tons will be required for export purposes.

Schemes under consideration.—The Ministry of Food and Agriculture has a proposal to develop and popularise high protein biscuits during the Third Plan period. These biscuits, the formula of which has been standardised at the Central Food Technological Research Institute, Mysore, are made by incorporating protein rich groundnut flour in the biscuits mix to the extent of about 40% with a view to increasing the protein content to about 18% as compared to ordinary biscuits which have a protein content of only 5 to 6%. The Ministry is setting up two units with 10 tons per day capacity each for the production of groundnut flour with UNICEF assistance. This groundnut flour will be utilised for the production of high protein biscuits, multipurpose food and protein rich wheat atta and wheat flour. The tentative proposal at present is to utilise 2 out of the 20 tons of groundnut flour produced per day in the manufacture of high protein biscuits by setting up 2 biscuit factories each of 3 tons per day capacity. The production of high protein biscuits, when this scheme materialises, will be about 1,800 tons per annum.

Targets of capacity and production.—Since the demand for biscuits produced in the organised sector is estimated at about 40,000 tons by 1965-66, production of the same order is envisaged by that period. In view of the foreign exchange difficulties it is considered that no further increase in the capacity of the biscuit industry should be allowed for the present and

that the contemplated increase in production should be achieved by multiple shift operation. However, to enable the units to produce better quality biscuits with modern plants, the replacement and modernisation of old plants will have to be favourably considered on the merits of specific proposals.

Raw materials.—Wheat flour, sugar and edible fats are the main raw materials required by the biscuit industry. In addition milk solids, honey, glucose, essences and malt extracts are also used in small quantities. All the raw materials are available indigenously.

B. CONFECTIONERY

I. Review of Progress in the Second Plan:

Targets.—The demand for confectionery was estimated to increase to 10,000 tons per annum by 1960-61. Since a large part of the capacity of 40,600 tons was lying idle at the beginning of the Second Plan, it was not considered necessary to create any further capacity during the Second Plan period. A capital target of 40,600 tons and a production target of 10,000 tons were envisaged for 1960-61.

Capacity and production.—At the beginning of the Second Plan, there were 40 units in the organised sector of the industry with an annual installed capacity of 40,600 tons. According to a re-assessment carried out by the Development Wing, there are at present 44 organised factories in the country with an annual installed capacity of 51,840 tons.

The State-wise distribution of industry is as given below:

State	No. of units	Annual capacity on single shift basis (tons)
Bombay (erstwhile)	14	12,348
Madras	6	10,296
Uttar Pradesh	5	3,756
Madhya Pradesh	4	8,061
West Bengal	5	2,754
Bihar	4	5,266
Andhra Pradesh	4	6,582
Mysore	2	2,775
TOTAL	44	51,840

In addition to the organised factories, a number of small unorganised units is also engaged in the production of confectionery. Reliable data on the capacity and production of these units are, however, not available.

The production of confectionery by the organised units during the Second Plan period has been as follows:

	Production (tons)
1956	9,475
1957	10,980
1958	10,361
1959	13,451
1960	17,000

It may be observed that except for the year 1958, production of confectionery in the organised sector has shown a steady increase during the Second Plan period.

Imports and exports.—Import of confectionery is at present banned. The quantity of confectionery imported during the Second Plan period has been negligible.

Though the industry has developed a small export market in Middle East, East Asian and African countries, the actual exports have not been substantial due to the price disadvantage of Indian Confectionery in relation to products from other competing countries. The total quantity and value of confectionery exported in the last few years are indicated below:

	Quantity (tons)	Value (Rs. lakhs)
1956	37	0·9
1957	120	1·5
1958	180	1·9
1959	62	1·0
1960	21	0·6

Consumption.—The quantity of confectionery available for consumption from the organised sector for the last few years on the basis of production minus exports (imports have been negligible) has been as given below:

(tons)

	Production	Exports	Quantity available for consumption
1956	9,475	37	9,438
1957	10,980	120	10,860
1958	10,361	180	10,181
1959	13,451	62	13,389
1960	17,000	21	16,979

Besides the above, an unestimated quantity of confectionery produced by the small scale unorganised factories was also available for consumption.

Quality.—The quality of confectionery manufactured by the organised units has shown considerable improvement and compares favourably with that of imported brands.

Problems of the industry.—As in the case of biscuit industry one of the main difficulties faced by the confectionery industry is the high price of indigenous sugar. With a view to boosting up export of biscuits and enabling confectionery units to offer confectionery at competitive prices in the foreign markets, the question of supply of sugar at reasonable prices to confectionery industry has been considered by the Development Council for Food Processing Industries and it has since been decided in principle to make available sugar to exporters of biscuits and confectionery at international price. With a view to securing more intensive utilisation of its existing capacity the Confectionery Panel of the Development Council had recommended that a rebate on sugar excise duty amounting to Rs. 290 per ton should be given to the confectionery units to assist the industry in the following ways :—

(a) To create a pool for financing a nation-wide campaign for increased consumption of confectionery ;

(b) To enable the industry to maintain the price level.

These recommendations of the Panel were ratified by the Council and are now under examination of the Government.

II. Programme of Development in the Third Plan:

Estimated requirements.—The present demand for confectionery manufactured in the organised sector is estimated to be about 17,000 tons. It is estimated that this demand will increase to about 25,000 tons by 1965-66. Out of this it is estimated that confectionery to the extent of about 500 tons will be exported in 1965-66.

Additional capacity.—The demand for confectionery in the organised sector is estimated at about 25,000 tons by 1965-66. Since a large part of the existing capacity is lying idle, it does not seem necessary to expand capacity further for meeting the anticipated demand in 1965-66.

Raw materials.—Liquid glucose, milk powder, condensed milk, sugar and essences are the main ingredients in the manufacture of confectionery. Liquid glucose of good quality is now available indigenously, milk powder & condensed milk are being manufactured in limited quantities. It is expected that by the end of the Third Plan period, the entire requirements of milk powder & condensed milk would be met from indigenous sources.

In addition small quantity of wrapping papers including printing cellophane & waxed paper is also required by the industry. Though most of these requirements are at present met through imports it is expected that by the end of the Third Plan period, the industry would be self sufficient in regard to these raw materials.

The following table summarises the programme of development for the biscuits and confectionery industry during the Third Plan:

	1960-61 (tons)	1965-66 (tons)
Biscuits (Organised sector)		
Capacity	30,528	30,528
Production	23,700	40,000
Exports	86	1,000
Confectionery (Organised sector)		
Capacity	51,840	51,840
Production	17,000	25,000
Exports	21	500

75. FRUIT AND VEGETABLE PRESERVATION

I. Review of Progress in the Second Plan :

Targets.—The production target for preserved fruits and vegetables was envisaged at 50,000 tons for the final year of the Second Plan. Of this, 11,000 tons were expected to be exported and the balance consumed within the country.

Capacity and production.—In 1955, there were 654 fruit and vegetable preservation units licensed under the Fruit Products Order promulgated under the Essential Commodities Act. The number has progressively gone up during the last five years as is evident from the following table:

	Number of licencees
1955	654
1956	715
1957	885
1958	949
1959	982
1960	996

The regional distribution of the licensed manufacturers in 1960 is given below:

	No. of units
Andhra Pradesh	43
Assam	10
Bihar	16
Delhi	68
Gujarat	52
Kerala	21
Madhya Pradesh	28
Madras	103
Maharashtra	250
Mysore	14
Orissa	3
Punjab and Himachal Pradesh	138
Rajasthan	25
Uttar Pradesh	96
West Bengal	127
Tripura and Manipur	2
TOTAL	996

Of the 982 licensed units in 1959, 694 were cottage scale (annual production below Rs. 10,000), 221 were small-scale (annual production between Rs. 10,000 and Rs. 1 lakh) and 67 had annual production amounting to

more than Rs. 1 lakh. Only 18 units had production of above Rs. 5 lakhs. Thus, the industry includes a very large proportion of small and cottage-scale manufacturers.

It is difficult to arrive at a precise estimate of the overall capacity of this seasonal industry. Many of the units operate only for a few months in a year depending upon the availability of fruits and vegetables and the demand for their products. Also, the concept of installed capacity is nebulous in the case of traditional fruit and vegetable products such as pickles, chutneys, preserves, syrups etc. because the production of these items is not carried on with the help of any machinery and can be easily expanded by employing additional workers.

The production of preserved fruits and vegetables from 1955 onwards is indicated below:

	tons
1955	14,060
1956	23,150
1957	25,580
1958	27,060
1959	32,120
1960	40,000

The production went up progressively during the Second Plan period but fell short of the target of 50,000 tons by about 20 per cent.

Imports and exports.—Consequent upon the balance of payments difficulties, which started in early 1957, there have been no significant imports of preserved fruits and vegetables. The exports from 1956 onwards have been as follows:

	(tons)	(Rs. lakhs)
1956	1,278	22
1957	1,763	31
1958	1,716	32
1959	1,465	28
1960	2,285	43

It is evident from the above figures that the progress towards achieving the export target of 11,000 tons visualised in the Plan has been well below expectations. This is attributed mainly to the comparatively high cost of production of Indian products. The Fruit and Vegetable Products Panel of the Development Council for Food Processing Industries and the Central Fruit Products Advisory Committee constituted under the Fruit Products Order have formed two Sub-Committees to suggest ways and means of reducing the cost of production of fruit and vegetable products and the cost of packing these products.

Government Assistance to the Industry

(a) *Subsidy on tinplate.*—In order to bring down the high cost of tin cans contributing as much as 20 to 30% of the total cost of canned products,

a subsidy of Rs. 500 per ton on tinplate used in the manufacture of open top sanitary cans for the fruit preservation industry is being given since June, 1958. An additional import duty of Rs. 200 per ton was levied on tinplate with effect from 1st April, 1960. This has not affected the export trade as the draw-back on the imported tinplate has been correspondingly increased. It has, however, affected the prices of fruit products for internal consumption and the question of enhancing the subsidy is, therefore, under consideration of the Government.

(b) *Rebate on sugar.*—In order to offset the high cost of sugar used in the exported fruit products, the following schemes have been in operation:

(i) A rebate of excise duty on sugar used in the manufacture of exported fruit products since December, 1957.

(ii) The scheme for stepping up exports of fruit products (excluding mango chutney) operated by the State Trading Corporation involving a subsidy of about Rs. 8 per maund.

Even these two concessions have not brought down the price of Indian sugar to the international level.

(c) *Loan assistance.*—A provision of Rs. 55 lakhs by way of loan assistance was made in the Second Five Year Plan for setting up 5 large-scale and 200 small-scale fruit preservation units. Complete information about the utilization of this provision is not available because the loans are sanctioned by the State Governments. It is, however, understood that these facilities have not been fully utilised mainly due to procedural difficulties.

(d) *Export promotion measures.*—Besides the schemes mentioned under sub-head (b) above, the following export promotion measures are in operation:

(i) Draw-back of import duty on tin containers used for packing exported fruit products since March, 1958;

(ii) Draw-back of import duty on glass containers used for exported fruit products since July, 1957;

(iii) Replenishment of tinplate quota used for the exported fruit products since December, 1957;

(iv) 50% concession in railway freight from the place of manufacture to the nearest port for export of fruit products since December, 1958.

Tariff Protection.—The Tariff Commission conducted an enquiry in 1956-57 into the continuance of protection granted to certain sections of the preserved fruits industry. On the recommendation of the Commission, protection was withdrawn from the 1st January, 1958.

II. Programme of development in the Third Plan:

Estimated requirements and target of production.—With the rise in incomes and the standard of living particularly in urban areas and new

industrial towns and larger horticultural production, the domestic consumption of preserved fruits and vegetables is bound to increase during the Third Plan period. There are good prospects of exports if sugar is supplied to the industry at international prices. This has recently been agreed to in principle by the Government.

The Fruit and Vegetable Products Panel of the Development Council for Food Processing Industries and the Central Fruit Products Advisory Committee have recommended a production target of 100,000 tons for fruit and vegetable products for the Third Five Year Plan, which has been adopted. Of this, 10,000 tons are expected to be exported.

The additional production is expected to be obtained by a fuller utilization of the existing capacity and through the establishment of new units in the fruit growing areas. Large-scale fruit preservation factories are being established at Joginder Nagar in Himachal Pradesh, Kodur in Andhra Pradesh and Silchar in Assam. Some capacity is expected to come up in the form of cooperative enterprises for which provision has been made by the Ministry of Community Development and Cooperation in their Third Plan. Experience shows that new fruit preservation units should be established in the fruit growing areas as against the present concentration of the industry in the consuming centres.

A provision of Rs. 1·25 crores has been made by the Ministry of Food and Agriculture in the Third Plan for the development of the fruit and vegetable preservation industry. This provision includes the subsidy on tinplate, loan assistance to the industry, establishment of fruit preservation factories in the public sector, training in fruit and vegetable preservation, mobile units for peripatetic demonstration and propaganda, loans for the establishment of cold storages in the municipal markets, etc. Some State Governments have provided for the establishment of small-scale fruit preservation units as part of their programmes for the development of village and small-scale industries in the Third Plan.

Requirements of raw materials.—The industry will require the following quantities of the principal raw materials to achieve the production target of 100,000 tons by 1965-66 :

	(tons)
Fruits and vegetables	150,000
Sugar	32,400
Tinplate	2,800

Imported tinplate is at present used for packing fruit and vegetable products. The requirements are expected to be met fully from indigenous sources as a result of the expansion programmes of tinplate production included in the Third Plan.

Establishment of regional research stations.—At present investigational work on fruit and vegetable preservation is carried out by the Central Food Technological Research Institute, Mysore (C.F.T.R.I.) and several other laboratories of the State Governments. To bring research closer to the industry and to attend to specific problems relating to certain varieties of fruits

and vegetables which are available only in specific regions of the country, it is proposed to set up regional research stations at Delhi, Saharanpur, Gauhati, Poona, Simla, Kulu, Nagpur, Calcutta and Trichur. A Research Station has recently been set up by the C.F.T.R.I. in the College of Catering and Institutional Management at Andheri (Bombay).

The following table summarises the development programme for the fruit and vegetable preservation industry in the Third Five Year Plan :

	1960-61	1965-66
Production (tons)	40,000*	100,000
Exports (tons)	2,285*	10,000

*Figures relate to the calendar year 1960.

INDUSTRIAL POLICY RESOLUTION

New Delhi, the 30th April, 1956.

No. 91/CF/48.—The Government of India set out in their Resolution dated the 6th April, 1948, the policy which they proposed to pursue in the industrial field. The Resolution emphasised the importance to the economy of securing a continuous increase in production and its equitable distribution, and pointed out that the State must play a progressively active role in the development of industries. It laid down that besides arms and ammunition, atomic energy and railway transport, which would be the monopoly of the Central Government, the State would be exclusively responsible for the establishment of new undertakings in six basic industries—except where, in the national interest, the State itself found it necessary to secure the co-operation of private enterprise. The rest of the industrial field was left open to private enterprise though it was made clear that the State would also progressively participate in this field.

2. Eight years have passed since this declaration on industrial policy. These eight years have witnessed many important changes and developments in India. The Constitution of India has been enacted, guaranteeing certain Fundamental Rights and enunciating Directive Principles of State Policy. Planning has proceeded on an organised basis, and the first Five Year Plan has recently been completed. Parliament has accepted the socialist pattern of society as the objective of social and economic policy. These important developments necessitate a fresh statement of industrial policy, more particularly as the Second Five Year Plan will soon be placed before the country. This policy must be governed by the principles laid down in the Constitution, the objective of socialism, and the experience gained during these years.

3. The Constitution of India, in its preamble, has declared that it aims at securing for all its citizens—

"JUSTICE, Social, economic and political ;

LIBERTY of thought, expression, belief, faith and worship ;

EQUALITY of status and of opportunity ; and to promote among them all.

FRATERNITY assuring the dignity of the individual and the unity of the Nation."

In its Directive Principles of State Policy, it is stated that—

"The State shall strive to promote the welfare of the people by securing and protecting as effectively as it may a social order in which justice, social, economic and political, shall inform all the institutions of the national life."

Further that—

"The State shall, in particular, direct its policy towards securing—

(a) that the citizens, men and women equally, have the right to an adequate means of livelihood ;

(b) that the ownership and control of the material resources of the community are so distributed as best to subserve the common good;

(c) that the operation of the economic system does not result in the concentration of wealth and means of production to the common detriment;

(d) that there is equal pay for equal work for both men and women;

(e) that the health and strength of workers, men and women, and the tender age of children are not abused and that citizens are not forced by economic necessity to enter avocations unsuited to their age or strength;

(f) that childhood and youth are protected against exploitation and against moral and material abandonment."

4. These basic and general principles were given a more precise direction when Parliament accepted in December, 1954, the socialist pattern of society as the objective of social and economic policy. Industrial policy, as other policies, must therefore be governed by these principles and directions.

5. In order to realise this objective, it is essential to accelerate the rate of economic growth and to speed up industrialisation and, in particular, to develop heavy industries and machine making industries, to expand the public sector, and to build up a large and growing co-operative sector. These provide the economic foundations for increasing opportunities for gainful employment and improving living standards and working conditions for the mass of the people. Equally, it is urgent, to reduce disparities in income and wealth which exist today, to prevent private monopolies and the concentration of economic power in different fields in the hands of small numbers of individuals. Accordingly, the State will progressively assume a predominant and direct responsibility for setting up new industrial undertakings and for developing transport facilities. It will also undertake State trading on an increasing scale. At the same time, as an agency for planned national development, in the context of the country's expanding economy, the private sector will have the opportunity to develop and expand. The principle of co-operation should be applied wherever possible and a steadily increasing proportion of the activities of the private sector developed along co-operative lines.

6. The adoption of the socialist pattern of society as the national objective, as well as the need for planned and rapid development, require that all industries of basic and strategic importance, or in the nature of public utility services, should be in the public sector. Other industries which are essential and require investment on a scale which only the State, in present circumstances could provide, have also to be in the public sector. The State has therefore to assume direct responsibility for the future development of industries over a wider area. Nevertheless, there are limiting factors which make it necessary at this stage for the State to define the field in which it will undertake sole responsibility for further development, and to make a selection of industries in the development of which it will play a dominant role. After considering all aspects of the problem, in

consultation with the Planning Commission, the Government of India have decided to classify industries into three categories, having regard to the part which the State would play in each of them. These categories will inevitably overlap to some extent and too great a rigidity might defeat the purpose in view. But the basic principles and objectives have always to be kept in view and the general directions hereafter referred to followed. It should also be remembered that it is always open to the State to undertake any type of industrial production.

7. In the first category will be industries the future development of which will be the exclusive responsibility of the State. The second category will consist of industries, which will be progressively State-owned and in which the State will therefore generally take the initiative in establishing new undertakings, but in which private enterprise will also be expected to supplement the effort of the State. The third category will include all the remaining industries, and their future development will, in general, be left to the initiative and enterprise of the private sector.

8. Industries in the first category have been listed in Schedule A of this Resolution. All new units in these industries, save where their establishment in the private sector has already been approved, will be set up only by the State. This does not preclude the expansion of the existing privately owned units, or the possibility of the State securing the co-operation of private enterprise in the establishment of new units when the national interests so require. Railways and air transport, arms and ammunition and atomic energy will, however, be developed as Central Government monopolies. Whenever co-operation with private enterprise is necessary, the State will ensure, either through majority participation in the capital or otherwise, that it has the requisite powers to guide the policy and control the operations of the undertaking.

9. Industries in the second category will be those listed in Schedule B. With a view to accelerating their future development, the State will increasingly establish new undertakings in these industries. At the same time private enterprise will also have the opportunity to develop in this field, either on its own or with State participation.

10. All the remaining industries will fall in the third category, and it is expected that their development will be undertaken ordinarily through the initiative and enterprise of the private sector, though it will be open to the State to start any industry even in this category. It will be the policy of the State to facilitate and encourage the development of these industries in the private sector, in accordance with the programmes formulated in successive Five Year Plans, by ensuring the development of transport, power and other services, and by appropriate fiscal and other measures. The State will continue to foster institutions to provide financial aid to these industries, and special assistance will be given to enterprises organised on co-operative lines for industrial and agricultural purposes. In suitable cases, the State may also grant financial assistance to the private sector. Such assistance, especially when the amount involved is substantial, will preferably be in the form of participation in equity capital, though it may also be in part in the form of debenture capital.

11. Industrial undertakings in the private sector have necessarily to fit into the framework of the social and economic policy of the State and will be subject to control and regulation in terms of the Industries (Development and Regulation) Act and other relevant legislation. The Government of India, however, recognise that it would, in general, be desirable to allow such undertakings to develop with as much freedom as possible, consistent with the targets and objectives of the national plan. When there exist in the same industry both privately and publicly owned units, it would continue to be the policy of the State to give fair and non-discriminatory treatment to both of them.

12. The division of industries into separate categories does not imply that they are being placed in water-tight compartments. Inevitably, there will not only be an area of overlapping but also a great deal of dovetailing between industries in the private and the public sectors. It will be open to the State to start any industry not included in Schedule A and Schedule B when the needs of planning so require or there are other important reasons for it. In appropriate cases, privately owned units may be permitted to produce an item falling within Schedule A for meeting their own requirements or as by-products. There will be ordinarily no bar to small privately owned units undertaking production, such as the making of launches and other light-craft, generation of power for local needs and small scale mining. Further, heavy industries in the public sector may obtain some of their requirements of lighter components from the private sector, while the private sector in turn would rely for many of its needs on the public sector. The same principle would apply with even greater force to the relationship between large scale and small scale industries.

13. The Government of India would, in this context, stress the role of cottage and village and small scale industries in the development of the national economy. In relation to some of the problems that need urgent solutions, they offer some distinct advantages. They provide immediate large scale employment; they offer method of ensuring a more equitable distribution of the national income and they facilitate an effective mobilisation of resources of capital and skill which might otherwise remain unutilised. Some of the problems that unplanned urbansiation tends to create will be avoided by the establishment of small centres of industrial production all over the country.

14. The State has been following a policy of supporting cottage and village and small scale industries by restricting the volume of production in the large scale sector, by differential taxation, or by direct subsidies. While such measures will continue to be taken, whenever necessary, the aim of the State policy will be to ensure that the decentralised sector acquires sufficient vitality to be self-supporting and its development is integrated with that of large scale industry. The State will, therefore, concentrate on measures designed to improve the competitive strength of the small scale producer. For this it is essential that the technique of production should be constantly improved and modernised, the pace of transformation being regulated so as to avoid, as far as possible, technological unemployment. Lack of technical and financial assistance, of suitable working accommodation and inadequacy of facilities for repair and maintenance are among the serious handicaps of

small scale producers. A start has been made with the establishment of industrial estates and rural community workshops to make good these deficiencies. The extension of rural electrification and the availability of power at prices which the workers can afford will also be of considerable help. Many of the activities relating to small scale production will be greatly helped by the organisation of industrial co-operatives. Such co-operatives should be encouraged in every way and the State should give constant attention to the development of cottage and village and small scale industries.

15. In order that industrialisation may benefit the economy of the country as a whole, it is important that disparities in levels of development between different regions should be progressively reduced. The lack of industries in different parts of the country is very often determined by factors such as the availability of the necessary raw materials or other natural resources. A concentraion of industries in certain areas has also been due to the ready availability of power, water supply and transport facilities which have been developed there. It is one of the aims of national planning to ensure that these facilities are steadily made available to areas which are at present lagging behind industrially or where there is greater need for providing opportunities for employment, provided the location is otherwise suitable. Only by securing a balanced and co-ordinated development of the industrial and the agricultural economy in each region, can the entire country attain higher standards of living.

16. This programme of industrial development will make large demands on the country's resources of technical and managerial personnel. To meet these rapidly growing needs for the expansion of the public sector and for the development of village and small scale industries, proper managerial and technical cadres in the public services are being established. Steps are also being taken to meet shortages at supervisory levels, to organise apprenticeship schemes of training on a large scale both in public and in private enterprises, and to extend training facilities in business management in universities and other institutions.

17. It is necessary that proper amenities and incentives should be provided for all those engaged in industry. The living and working conditions of workers should be improved and their standard of efficiency raised. The maintenance of industrial peace is one of the prime requisites of industrial progress. In a socialist democracy labour is a partner in the common task of development and should participate in it with enthusiasm. Some laws governing industrial relations have been enacted and a broad common approach has developed with the growing recognition of the obligations of both management and labour. There should be joint consultation and workers and technicians should, wherever possible, be associated progressively in management. Enterprises in the public sector have to set an example in this respect.

18. With the growing participation of the State in industry and trade, the manner in which these activities should be conducted and managed assumes considerable importance. Speedy decisions and a willingness to assume responsibility are essential if these enterprises are to succeed. For

this, wherever possible, there should be decentralisation of authority and their management should be along business lines. It is to be expected that public enterprises will augment the revenues of the State and provide resources for further development in fresh fields. But such enterprises may sometimes incur losses. Public enterprises have to be judged by their total results and in their working they should have the largest possible measure of freedom.

19. The Industrial Policy Resolution of 1948 dealt with a number of other subjects which have since been covered by suitable legislation or by authoritative statements of policy. The division of responsibility between the Central Government and the State Governments in regard to industries has been set out in the Industries (Development and Regulation) Act. The Prime Minister, in his statement in Parliament on 6th April 1949, has enunciated the policy of the State in regard to foreign capital. It is, therefore, not necessary to deal with these subjects in this resolution.

20. The Government of India trust that this restatement of their Industrial Policy will receive the support of all sections of the people and promote the rapid industrialisation of the country.

SCHEDULE A

1. Arms and ammunition and allied items of Defence equipment.
2. Atomic energy.
3. Iron and steel.
4. Heavy castings and forgings of iron and steel.
5. Heavy plant and machinery required for iron and steel production, for mining, for machine tool manufacture and for such other basic industries as may be specified by the Central Government.
6. Heavy electrical plant including large hydraulic and steam turbines.
7. Coal and lignite.
8. Mineral oils.
9. Mining of iron ore, manganese ore, chrome ore, gypsum, sulphur, gold and diamond.
10. Mining and processing of copper, lead, zinc, tin, molybdenum and wolfram.
11. Minerals specified in the Schedule to the Atomic Energy (Control of Production and Use) Order, 1953.
12. Aircraft.
13. Air transport.
14. Railway transport.
15. Shipbuilding.
16. Telephones and telephone cables, telegraph and wireless apparatus (excluding radio receiving sets).
17. Generation and distribution of electricity.

SCHEDULE B

1. All other minerals except "minor minerals" as defined in Section 3 of the Minerals Concession Rules, 1949.
2. Aluminium and other non-ferrous metals not included in Schedule 'A'.
3. Machine tools.
4. Ferro alloys and tool steels.
5. Basic and intermediate products required by chemical industries such as the manufacture of drugs, dyestuffs and plastics.
6. Antibiotics and other essential drugs.
7. Fertilizers.
8. Synthetic rubber.
9. Carbonisation of coal.
10. Chemical pulp.
11. Road transport.
12. Sea transport.

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